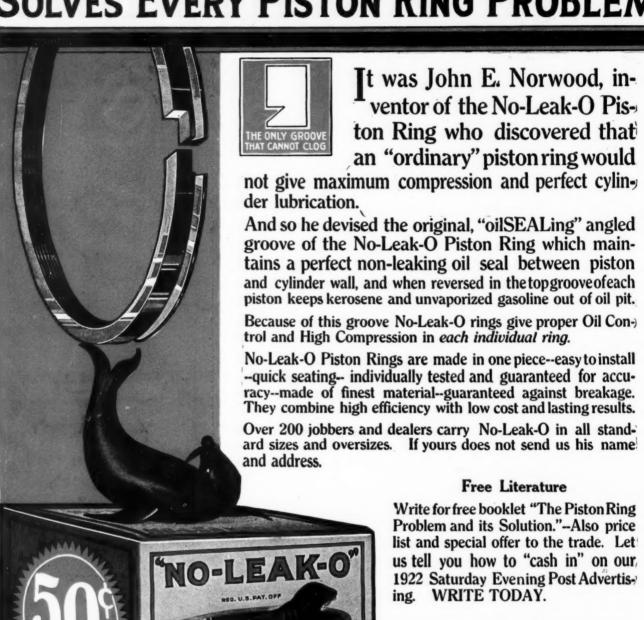
MOTORAGE

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No. 15

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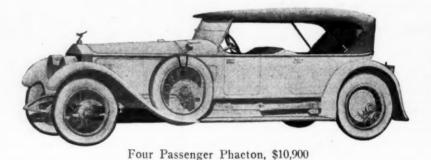
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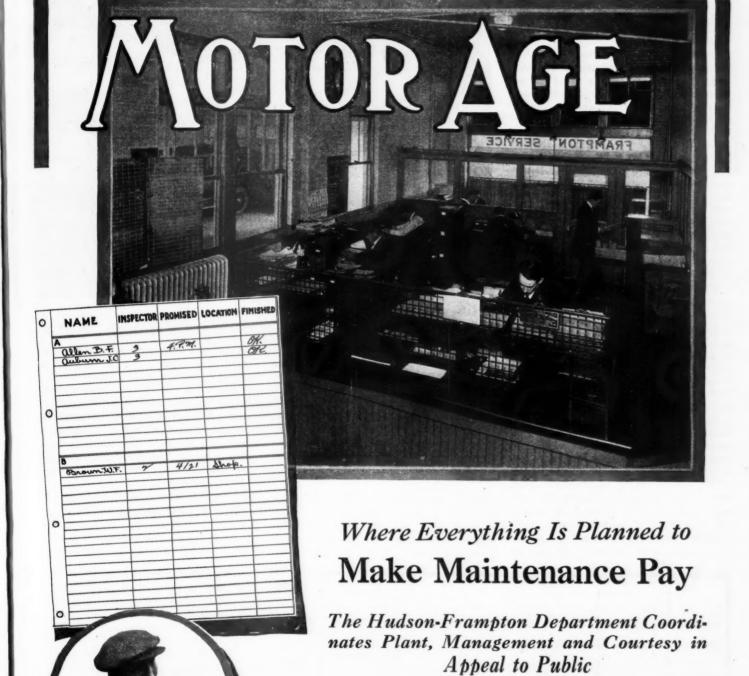
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Three things which help sell Hudson-Frampton maintenance in St. Louis are: Service Manager Hoffner, the efficient handling of routine and the blackboard, from which any customer can be informed at any time just where his job stands

THOSE dealers who are planning a new maintenance building or thinking of making additions to their present building will find an outdoor quick service department, or "quick service yard," as it generally is referred to by those who use one, worthy of much thought. The installation of such a yard may be the solution of many present difficulties which the maintenance departments of dealers generally have to contend with.

A maintenance building constructed with two or more floors probably never can be as efficiently arranged to handle the work quickly and without confusion as the one built as a single story and with a service yard adjacent.

By B. M. IKERT

One of the best examples of such a building, is the maintenance department of the Hudson-Frampton Motor Car Co., St. Louis, Mo. It is probably one of the largest, if not the largest, and most completely equipped building of its kind in the middle-west.

The things which impress those who visit this maintenance department are the convenient arrangement of the entrances, the service office, the handy location of exits, the ease with which customers are directed, the lack of disorder and the cleanliness about the entire institution. Probably the greater part of this institution's success and the profitable way in which it is selling its maintenance on Hudson and Essex cars. is due to Service Manager, A. N. Hoffner. He is as necessary to the institution as the machine shop, the accounting department or the corps of mechanics, because the good will manifested towards Hudson-Frampton maintenance in St. Louis has largely grown around the service manager. As one person expressed it, "This service station is like one big family and we car owners feel like one of the big family."

What better attitude on the part of customers towards any business could be desired than this?

That feeling towards the maintenance department is sufficient proof in itself to indicate that the right methods and policies have been used by Hudson-Frampton in its selling of maintenance. The organization has a good building, yes. It has a good service manager, yes. It has good equipment, good mechanics, keeps good records and does much which other maintenance organizations do, yet these other organizations frequently fall flat on their efforts to sell maintenance, while this St. Louis organization prospers. You ask why? Here's the reason, as we are able to see it by a twoday observation of the organization.

While we have indicated that this place is about as efficiently laid out as

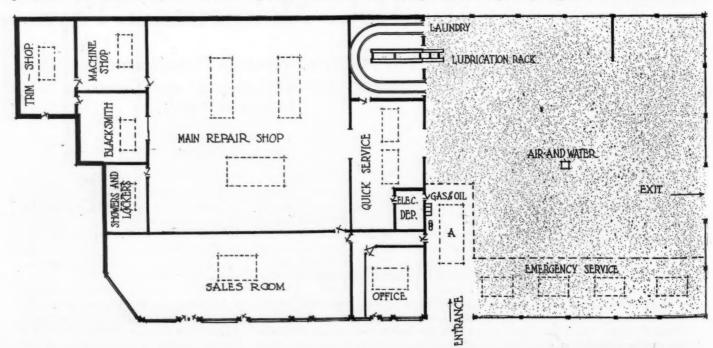


Here is shown the "yard" used by Hudson-Frampton in the selling of motor car maintenance. Cleanliness is apparent on all sides. The yard is cement. At the left is

it can be, has good equipment, good personnel, etc., it has above all, that subtle something in its atmosphere, which makes you feel at home; makes you have confidence in the work turned out. Hoffner has instilled this desire to serve in all of the employes. You see it all along the line. Customers are treated as guests. Courtesy is one of the outstanding features, and yet it is not overdone.

While the company admits that the customer is the meal ticket, it also realizes full well, that the selling of automobile maintenance is one of the most legitimate businesses ever brought forth

and that while the thought that "the customer is always right," is applied as much as possible, it is done so up to a certain point. Hoffner has well lined up his organization and can stand behind every job which goes out, so that there is little chance left for a customer to condemn a job from the standpoint that it has not been done properly. The system which he has installed, is so well carried out that it functions without a hitch, should he be gone several days at a time. The details of the business are left to attendants, while he can devote his time to the major problems and keeping everything in check so that no loose



Plan of the maintenance building and yard. Note that the arrangement is such that there is no time lost between the various departments. The office is about in the center of the institution and all activities radiate from it



shown the service entrance, while on the right is the emergency service department where minor repairs are made and new cars checked up before delivery to customer

ends will be flying about and gnawing at the profits.

As a test, as to whether the work as handled here, is properly sold to the customer, it might be of interest to mention that in the time spent by a Motor Age representative, in this place, not a single customer was heard to argue about his bill or the quality of work done. When you see customer after customer driving away with smiles on their faces, you quite fully realize that here is a place wherein the selling of maintenance has been studied as a business and is being dealt with as such.

You hear no one cursing the place. No one murmurs "Robbers," or "gyps." You fail to see an angry look on a customer's face, because someone has carelessly laid a greasy wrench on the upholstery of his car, or has failed to wipe off the steering wheel rim and controls. No customer seems amazed at the price of his repair bill. There is no need for such amazement. As Hoffner says, "Do all your arguing before the work is started." Not a job is touched in the Hudson-Frampton maintenance department, until the customer knows exactly what his bill is going to be, and he has signed for the work. Perhaps he cannot be given a flat rate price immediately he brings his car in, but he is given the cost as soon as the part in question has been torn down and its condition ascertained. If necessary, the customer comes out and looks the parts over. He is not required to take the maintenance department's word for anything, although, Hoffner states that in nine cases out of ten the customer gives them the "go-ahead" on the job when he called over the telephone. Here, again, is shown the confidence which has been instilled in the customer through

his former dealings with this organiza-

While the organization is made up of a good many people, there are not too many officials around the place. The customer is not directed to a half dozen people before he gets his wants attended to. There are just three people, the service manager, the assistant service manager, and the inspector with whom the customer comes in contact, excepting, of course, the people in the office at the time when the bill is paid. The customer never sees a mechanic, because with the system as established, there is no need for him to do so. All of the trouble shooting is done by the inspector who is fully competent to make a report about the car's condition.

This preliminary inspection, by the

way, is something about which this organization is very particular. It realizes that the initial contact with the customer will result in either getting his good will or building resistance to future sales. He must be sold right at the start and the first thing done is to ascertain as nearly as possible, what must be done to a car to bring it up to the point where the customer wants to drive it or to that point at which the maintenance department knows the car ought to operate to give the best satisfaction to the man who has paid good money for a car from which he expects to get full value for that money.

When a car comes for adjustments of any kind, or repair work, it enters the premises by the entrance shown in the plan view. If the customer wishes to be interviewed by a service salesman, he brings his car to rest at the spot A. It is then but a step into the office, but as a general thing, he is met without his having to get out of the car.

Should he merely want to fill his radiator or pump up the tires on his car, he simply drives on to the air and water station, located in the center of the "yard." As will be noted from the plan view, the exit is handily arranged, so that a customer does not have to turn his car around and drive out through the same door by which he entered. Both entrance and exit are located on a street, and inasmuch as the maintenance building is located quite a distance from the center of the city, there is no heavy traffic condition or things of a similar nature to bother women drivers who might feel a little timid about driving a car through congested streets.

If it so happens, that the car which has been driven in, needs an adjustment of the carbureter, ignition points dressed up, brakes adjusted or some similar operation which usually can be done in



A water and air station in the center of the yard makes it handy for customers to drive in and help themselves. Note the drain which takes care of overflow water and the covers, which when closed present a flush surface

CAR No.	н	UDSON CAR RECORD	DATE INV.	FREIGHT PAID	
MOTOR No.	DATE BOLD	INVOICE NO	DATE RECEIVED	WAR YAX	
TRANS. No.	NAME		INSURANCE No	PRICE	
CLUTCH No.	ADDRESS	ADDRESS R. R.			
BODY No.				VIA	TOTAL PRICE
COLOR	INVOICE DATE	INVOICE No.	CHECKED 8	Y	RECEIVED
EQUIPMENT	COVER No.	AMOUNT			• • •
TIRES	REWARKS			-	
AXLE MATIO		1			
STORED		STO	RAGE CHARGES PAID	то	

NAME				PHONE			TYPE	CAR	No.	
DATE	SHOP ORDER No.	INVOICE NO.	AMO	UNT	MILES	DATE	SHOP ORDER #0.	INVOICE N	. AMOUNT	MILES
				T						
			-	-	-					
			-	_	-	-	-			
							-		-	-
		-	-	-						

The new car record card. A card like this is made out for every car sold and shows its history from the time of purchase. On the reverse side the visits of the car to the maintenance department are indicated. From the shop order number it is possible to tell at all times just what work has been done on the car

a few minutes, the car is driven into a stall at the emergency service department. Or, it may be left in the yard where an attendant takes care of the work immediately.

If the job runs an hour or less, it is handled in the emergency service department, or in the quick service department, which, as will be noted from the ground plan is located about in the center of the building. New cars coming from the factory are conditioned in the quick service department also.

Right here it might be stated that at no time does a customer drive into this maintenance building and wander aimlessly about in quest of someone to take care of him. Our observations showed that when the inspector was busy with some other customer, some one in the organization, it might be the service manager, his assistant, or some one else near the office, would presently inform the customer that his wishes would be attended to in a few minutes.

While Hoffner has an office of his own, he spends the greater part of his time in the various departments. Especially does he try to be about the service "yard" as much as possible, because it is here where the customers gather. The service manager has spent many years in the shop and knows all of the phases of repair work. He frequently is called into conference with the shop foreman. He has torn down and rebuilt probably as many engines and rear axles as the next man and can therefore, pass judgment on anything that might come up in the shop.

When the inspector finds that a car must go to the main repair shop, the customer is so informed and then the necessary steps are taken whereby he is sold on the work that is to be done. He has a thorough understanding of what

Lessons From the Successful Big Fellows

THIS article deals with the selling of maintenance in a large city and by a large institution. Naturally much of the matter set forth is applicable only to a maintenance department of considerable size and operating in a large city. There are, however, many things which can be applied to the small town dealer's business. He can learn many valuable lessons from the way in which this organization sells its maintenance, because, after all, the job is much the same whether the dealer is located in a city of a million or a thousand people.

Next week we are going to follow this article with one pointing out the things which the smaller maintenance department can apply to its own business. The small dealer may think there are only large town ideas in this article. There are. But, there are small town ideas as well. Steam runs a locomotive, but it also runs your boy's toy engine. The theory is the same in both cases.

Likewise the theory of selling maintenance is the same, no matter where you find it. The one big job is to make maintenance pay. is going to be done to his car before he leaves the place and the order of procedure is like this.

The inspector makes out a report, a reproduction of which is shown. This report contains all the labor operations to be performed on the car. In addition it contains the date the car was received, time of inspection, date promised, owner's name, address, 'phone number, car number, mileage, etc. If necessary, the inventory of the equipment is taken in the presence of the owner. When all has been done, the owner signs his or her name in the space provided. Just before this, the owner has been given the price of the work to be done, so that there is a thorough understanding as to the bill before any work is done.

Guarding a Reputation

Should the job be of such a nature, that a dismantling of the engine or some other part is necessary before an inspection can be made, and the necessary labor operations listed, the unit in question is torn down and after the inspection the owner is notified over the telephone or if the job is one which is going to run into considerable money, he is asked to come out, so that he might see for himself just what has to be done. No work is done without the consent of the owner. On the other hand, the company tries to sell the owner on having work done which it deems necessary to bring the car up to the standard of performance desired, both by the owner and the company.

Also if in the dismantling of a job it is found that some outside shop has done work on the unit and this work has not been done correctly or satisfactorily, the owner is notified. This absolves the company from all blame should something go wrong with the unit at a later date, when it might seem that the work was not properly done in this shop. Any error which is observed is rectified in some manner, so that there is no chance for a customer to doubt the quality of work done.

If another shop has bungled a job the Hudson-Frampton company does not say, "We should worry, we didn't do the work, let it go at that." No! The company wants every car of the make it handles in that territory, to be as nearly perfect in operation as it can be made. Therefore, it knows that not only must it do its own work well, but correct whatever work may have been poorly done by someone else.

After the inspection report has been signed by the customer, a clerk makes out the shop repair order, which also is signed by the customer. Then a yellow tag, marked "Repair" is hung on the car, together with shop order, which is placed inside a leather pouch having a transparent celluloid face, so the shop order can be read through it. Protected in this way the order will not become defaced. The other side of the yellow

tag contains the name of owner and his address. The date also is put down.

It will be noticed that the face of the shop order, which by the way, is a large envelope, contains also the items which might be done outside the main repair shop, such as, washing, trim shop, etc. All labor operations are noted on the reverse side of the envelope and, of course, are brought over to the face side for totaling. Thus the total amount of the bill will appear in the lower right hand corner. When all of the items have been listed and the car properly ticketed, it is routed to the main repair shop.

The car then is assigned to a mechanic, who makes out requisitions for any parts that might be needed. Each slip he makes out is put into the envelope, another copy goes to the clerk, while a third is sent to the stock room for record. The requisition slip is priced in the office and the total of the requisitions is put on the face of the repair order envelope.

A Handy Blackboard

While all this has been going on, an attendant places the owner's name on a blackboard in the office. This board is a hinged device, arranged like the leaves in a book. Names beginning with A appear under that letter, and so on. The information contained on the board is shown on these pages in an illustration. This blackboard is one of the handiest things of which this maintenance department boasts. An owner has but to call on the telephone about his car and he can be told in a few seconds just where the job stands. Thus, if his car has been promised for 4 o'clock on a certain day and he calls up at noon on that day to find out if the car will be ready, the clerk looks at the board, sees that the job has been marked O. K., and tells him the car is ready. Just as soon as a tester has taken a repaired car out for a trial and pronounces it finished, the information is transferred to the board.

The car record card which is made out for every new car sold by the company, has proven of great value. It is reproduced on these pages. It contains all the information which might be of use later on and every time the car comes in for maintenance, notation is made on this "history" card. A customer cannot say he was in the shop only a few weeks ago to have some certain work done when the history card shows he was in six or eight months ago. These cards have been made for every car sold since the beginning of this company. From the shop order number it is possible to get the repair order envelope, containing all the operations done on the car at that particular time.

When a car is finished and the inspector has pronounced it O. K., he places a blue tag on the radiator filler neck. This tag is marked "Job Finished," and bears the inspector's signa-

Date Rec'd 9 19 Inspects	SAINT LOUIS	Rep	air r No.	3954
	Car			
Phone No. Type of			No.	
Vame			age	
Address			se No.	
Work Authorized by Owner	***************************************	Licer	140	
Tork Authorized by Owner				
			-	
				1
	*			
-	*			
	*			
	*			
	*			
	*			
	Trim S	hop	1	
			8	
	Trim S			
DEMADE	Trim S		\$	
REMARKS	Trim S Labor Carbon	tious.	3	
REMARKS	Trim S Labor Carbon Requisi Outside	tions .	\$	
REMARKS	Trim S Labor Carbon Requisi Outside Wash	tions	\$	
REMARKS	Trim S Labor Carbon Requisi Outside Wash Polish	tions	\$	
REMARKS	Trim Sr Labor Carbon Requisi Outside Wash Polish Class 8	tions		
REMARKS Tools and equipment must be inventoried	Trim S Labor Carbon Requisi Outsids Wash Polish Class 8	hons		

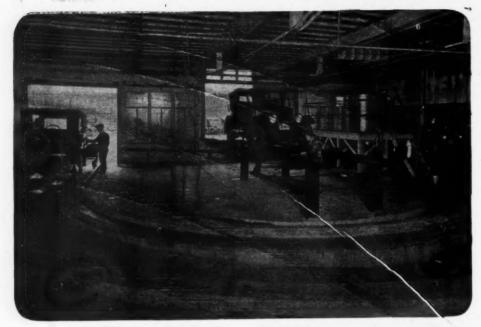
The repair order envelope. When the work has been completed on the car this envelope is filed for future use. It contains all the requisitions, etc., for that particular job

		FRAMPTON MOTOR	CAR CO.	
Not responsible for tools, robe tires, spare parts or accessories is in or on this car except when re- ularly deposited and checked b	ft B	BAINT LOUIS REPAIR DEPARTMENT		
owner at our Service Office.	-	INSPECTOR'S REPORT no no responsibility for damage to this car from other causes, while in our possession.	fire or	
		Phone No.		
Time Inspected	19	Inspected By	Car No	
		Make of Car		
Name		Type of Car	Mileage	
Address			License No.	
	D	ate	Signed	
		AIRS AND ADJUSTMENTS	Signed	AMOUNT
	REP		Signed	AMOUNT
	REP	AIRS AND ADJUSTMENTS	Signed	AMOUNT
	REP	AIRS AND ADJUSTMENTS	Signed	AMOUNT
QUANTITIES	REP	AIRS AND ADJUSTMENTS	Signed	AMOUNT
QUANTITIES	REP	AIRS AND PARTS ARE CASH	Signed	AMOUNT
QUANTITIES	REP	AIRS AND PARTS ARE CASH	Signed	AMOUNT

The inspector's report or work order which must be signed by the customer before any work is started. From this report the regular shop order is made out, which by the way, is the envelope shown above

ture and the date. The car then is routed to the "yard" where the owner can spot it or have an attendant locate it for him. Every car is marked with a blue tag and the job of locating one is simple.

Every new car is given a thorough inspection before being turned over to the purchaser. In doing this, everything down to the equipment is checked. One man checks the equipment while another reads the items off a list. Any missing





Two views in the laundry. Note how the car is automatically sprayed. The cement runway also is shown. The car travels around it with the rear wheels on a dolly, which automatically drops out at the exit. The lubrication rack is in the center

articles are supplied from the stock room and proper notation made thereof. After 500 miles of driving, the customer brings the car back for an inspection. The company requests this. The owner pays only for any oil, grease, or similar materials used in this inspection and tuning. Seasonable literature is sent out to all Hudson and Essex owners and results in many cars being driven in for accessories, adjustments or operations especially desirable at the time.

A word about the building. It is above all else, clean and attractive. It is well arranged. No one gets into another's way. There are no wasted steps. For example, in the main shop the engine and axle departments which are constantly in need of new parts are placed

close to the stock room. The new men work close to the foreman at first, where he can keep watch over their progress. Later on, as they become efficient and he feels they know the work they are moved to other sections. Each mechanic has his own bench and this bench is fitted with two large drawers for his tools and belongings. In addition, each man's bench has a smaller drawer for the helper's tools, etc.

Each man's bench has its own equipment as to vise, air, water and electric connections, fire extinguisher, etc. In addition, there is a very large vise in the blacksmith shop for straightening large parts that are hammered. This vise is mounted on a beam sunk into 5 ft. of cement. It not only does the work, but

eliminates any danger to the men. The main shop is fitted with ventilators which carry out all exhaust gases.

The machine shop is complete in its makeup and contains the usual machine tools such as lathes, drill press, etc. The shop does everything but cylinder regrinding and crankshaft regrinding. This company finds it more advantageous to send this class of work to some one specializing in it. The machine shop is in charge of a competent machinist and only he is allowed therein. When a mechanic wishes to reface the valves in an engine, he hands them to the machinist, who does the refacing in a machine designed for the purpose. Thus, while the machinist is doing this, the mechanic might be cleaning out carbon, etc., saving time all around. The lathe in the shop has proven of great benefit in making bushings and bolts.

The company has found the trim shop to be of considerable value. Frequently, a car comes in for work on the chassis and during the process of lining up the work to be done the owner mentions the fact that the top is torn, a seat cushion ripped, or that he would like to get one or two new side curtains. Unless a maintenance division is equipped with a trim shop, work of this nature has to be sent out and may result in a car being tied up in the dealer's maintenance department an unnecessary length of time.

Automatic Sprays Save Time Washing Cars

As it is in the Hudson-Frampton organization, work of this nature can be handled while the other repairs are going on and thus little time is lost in getting the car out. It also helps in selling the customer on the fact that you are equipped to do about every kind of job that might arise in the maintenance work on his car.

If there is one department of which Hudsen-Frampton might well boast, it is the laundry. In this room a cement runway has been constructed so that cars can be worked upon with ease. An automatic sprayer takes most of the mud and grease off a car and can be operating while the men are busy on another car with sponges and rags. The rear axle of the car when it comes into the laundry is placed on a dolly, so the wheels can be turned around for convenience in cleaning. As the car proceeds around the track, the dolly drops out from underneath at the exit. A depression in the runway allows the dolly to automatically drop away and the car rolls out into the "yard."

The lubrication rack in the laundry is fitted with a chain hoist so that the weight of the car is taken from the springs, allowing the leaves to separate for greasing. This has proved to be a big timesaver as well as to insure of proper lubrication of the understructure of the car.

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If You Clean Up the Maintenance, Sales Will Take Care of Themselves—

C. S. Mott

IN this address, given at a meeting of Oldsmobile dealers, the vice-president of the General Motors Corp. pays a high tribute to the maintenance end of the automotive industry,

OW, in regard to maintenance of ears! It seems to me there is a great deal that can be done in the way of improvement along this line. A friend of mine in Flint, came back from a tour in the east. He had a pleasant trip and told me about having some repair work done at a certain station and various others along the line, but here was this one particular place, where he claims he had found wonderful service.

He was well treated, the charge was right and the work well done, the man in charge having sent him away feeling fine and he couldn't tell me enough about it, and how he thought that all other maintenance stations ought to be on the same basis,

It wasn't very long after when I was in Detroit, I met a man connected with the company that made the car my friend had driven, and I spoke to him about it. I didn't mention to him where the place was, but he immediately said:

"Oh, yes, that was so and so," and he named the man and the place.

Well, flow, it seems to me that we come to a pretty pass when there can be one man in the country who gave such excellent service that when we simply mention it to somebody else in the organization, that you had gotten some very fine service, and don't tell him where it was that they knew immediately who that man was.

Now, there didn't seem to be any question in his mind of any particular commendation for that particular place and it seems to me that there is quite an opportunity; that where there are men who get a reputation in that way and there are men—this is not the only one in the country by any manner of means and that is not the only make of car that has men who handle service in that way.

How the Car Owners Consider Proper Maintenance

In all the different cars that are produced by the General Motors Company we can think of men in all parts of the country who really build up quite a reputation for themselves by the service they give and it does seem to me that perhaps those who do not give quite as good service could well look around and copy from those who do.

To show what service really does: I was talking with a branch manager of one of the divisions the other night; he told me that he had been sent over to take charge of a certain branch of one of the divisions at a certain



C. S. MOTT

city, and he said when he got there the people were not interested in his line of cars at all. They said that they had had such poor service that there was no demand for the cars and that sort of thing. So instead of trying to start right out to sell cars, he just quit trying to sell cars and started to clean up on the maintenance.

He got a list of all the owners of his cars and started to service them, and by the time he cleaned up on the whole lot, the people began to buy and he told me that the last year there was a time when his cars were the only cars, outside of Fords, that were having any sales at all in this particular town.

In other words, he felt that if he went after the maintenance the sales would take care of themselves, and that was perfectly true in this particular case. I am very sure that many cars have been sold in places where maintenance was good simply on

the basis of the service that they got.

In liquidating a couple of our smaller divisions, we found that in closing out the cars we had to sell them at a quite a bit below list—the difference between the selling price and the list price, representing what the buyer valued service at.

Sell Quality—Not Price

In New York, in talking to various people who were observing what was going on at the show, some of those who were selling cars and one thing and another, it was mentioned that in a good many of the places that the people that were trying to sell ears were trying to do it solely in the matter of price. They would stand off and they would say, "Look at our car here. See all you get. Why look at the price. See all you get for so much."

But the price was the prominent thing.

Well, now it so happens that there was one particular company that had no reduction in price at all. In fact one of their models had raised the price somewhat. They could not talk particularly about the price if they wanted to. What they had to talk about was quality, the improvements in the car and utility and all that sort of thing, and the price was the last thing that they mentioned; as it should have been. And their report was excellent. They sold a lot of cars at the show and came away feeling fine about it.

Therefore it seems to me instead of putting the emphasis on the price, that the price is the last thing of all. It seems to me that in our line of cars, we have so many other things that we can talk about that we can

leave the price to the last.

New Stutz Engine More Powerful; Higher Maximum Car Speed

Better Handling of Fuel, Lighter Pistons and Better Circulation of Water in Block Among Contributing Factors. Chassis Remains Practically the Same

THE power plant of the new Stutz has come in for a number of changes, while in the chassis only minor refinements are in evidence. The bodies remain practically the same and there has been no change in price. No radical changes have been made, but the horsepower output of the engine has been increased, the fuel consumption lowered, higher maximum speed obtained and acceleration made more pronounced. Lighter pistons, better handling of the fuel and more scientific design of the cylinder block with respect to the circulation of the

10 to 60 miles per hr. has been increased by 90 per cent and cold weather performance has been improved by the adoption of a hot-spot system. The chassis is now more quiet, due to the use of extensive anti-rattle features throughout the chassis and the accessibility of a number of units has been notably increased.

One Feature of Engine Is Length of Connecting Rods

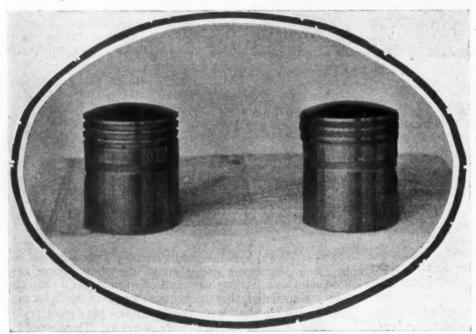
The pistons are shorter and have thinner walls. Flexibility in the piston wall has been secured, due to thinness, permitting the piston to conform more accurately to the cylinder bore. The piston there is a reinforcement by means of special shoulder bolts which run completely through the crankcase to the cylinder block.

In the construction of the crankcase, it is estimated by the Stutz company that the rigidity has been increased by 50 per cent. This has been accomplished by extensive ribbing. Notably, the most radical changes outside the detachable head cylinder are in the efforts made to more efficiently handle the fuel. The principal feature is in the manifold, which is designed to create a whirlpool action. In the circular chamber in which this whirlpool action takes place. the liquid particles are hurled, according to the designers, against the internal fins. These fins are heated by the gases drawn from the exhaust through a tube running directly across the engine between the central cylinders. This tube is in a dead air pocket which tends to eliminate any extensive radiation from the tube itself and permit a maximum amount of heat to be conducted over to the heated fins. The heated portion of the intake is so constructed as to entrap only the liquid particles in the intake stream, the ribs being in the form of a hot ring.

Improvement on Handling of Gases in Combustion Chamber

The intake has been designed with every passage sloping away from the cylinders so that all drainage is back toward the carbureter, and the manifolding material is of aluminum in order to take advantage of the heat conducting properties. The intake manifold is attached to the engine by means of an aluminum flange, the area and thickness of the aluminum flange being determined upon a basis for correct heat transference of the engine to the intake system. The passages throughout the system have been developed to give an equal distance of gas travel to all cylinders. In the operation of the pre-heated intake system, about one-fourth of the exhaust volume is handled independently of the main exhaust line. It is claimed that this tends to relieve back pressure on the exhaust with an increase in economy which is furthered by the cooling effect of the fan on the front end of the exhaust line which is carried toward the radiator. This arrangement also serves to keep the engine heat out of the front compartments of the car.

Another improvement in the handling of the gases in the combustion chamber



The cast-iron pistons of the Stutz "D-H" engine are light enough to be unusually flexible in conforming to cylinder variations. Three rings are used. The one in the wiper position has circumferential slots out through the ring, leading to oil passages in the ring groove. Slightly more than the usual clearance is successfully used, providing a heavy oil cushion. The piston pin floats in both piston and connecting rod

water, elimination of hot spots or steam pockets and the adoption of a detachable cylinder head all have contributed to the increased efficiency and performance of the engine.

As a result of these changes, the horsepower output is increased more than 50 per cent, the speed range has been broadened out at both ends, being five miles per hr. as compared with 10 miles per hr. at the lower end and 75 miles per hr. as compared to 60 miles per hr. at the other extreme. The acceleration and hill climbing ability, from

pin is a floating type, the pin being retained by means of a groove and spring retainer as in former customs.

One of the features of the Stutz engine is the length of the connecting rods, these being 14 in. from center to center. The crankshaft diameter has been increased by % of an in., the bearing lengths of the crankshaft are now 3% in. at the forward main bearing, 2% in. at the center main bearing and 4½ in. at the rear main bearing, with 2½ in. diameter. The bearings are supported in the aluminum crankcase and in addition

is due to the adoption of the detachable cylinder head, which has permitted completely machined combustion chambers. Owing to the material improvements in equalization of cylinder compression, it is the opinion of the Stutz engineer that this has had considerable to do with the elimination of much of the vibration. The ability to secure smoother surfaces in the machined combustion chambers also has resulted in less adhesion of carbon particles. The cylinder head casting is a girder type with very extensive ribbing on an extremely large number of studs holding it in position to avoid the danger of oil seepage or the possibility of blowing the gasket.

In the arrangement of the cylinder block; considerable has been done in the way of refinements in the water passage and in the removal of masses of metal which would cause disproportionate expansion and contraction. The water openings have been designed to produce small eddies within the main body of water to equalize the cooling effect by sweeping away hot water and replacing it with cool water at the point of contact with the heated metal. The water is circulated by centrifugal pump and the fan incorporates a centrifugal feed oiling system which carries a supply of lubri-

cant sufficient for a season's running without replenishing. The oiling system has been considerably refined also. This is a pressure feed system distributing through integrally cast, steel lined oil canals. One of the features of the system is that exposed tubing, unions and solder joints are avoided by this casting-in process. The oil leads run to the hollow crankshaft and also the camshaft bearings from which it is sprayed constantly to the valve operating mechanism.

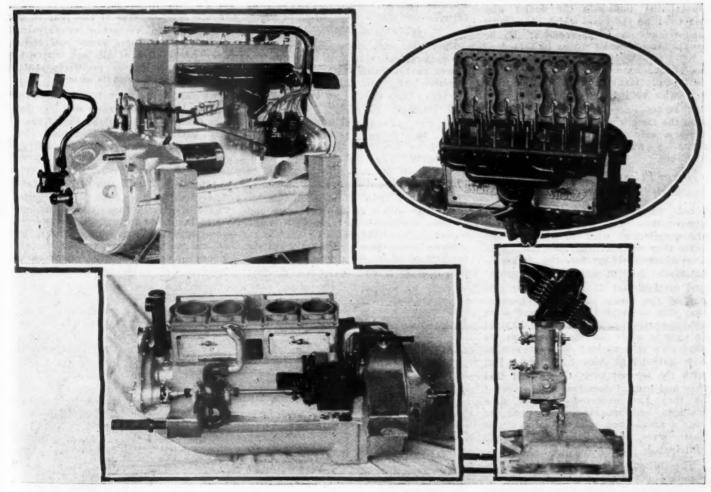
Twin Ignition Unit Is Driven From Timing Case

The entire front-end engine drive is lubricated by oil supplied through the hollow stud of the central idler gear of the six-gear timer train. It will be remembered that the Stutz is a four valve to the cylinder engine and that there are two camshafts. The idler gear has holes drilled through the hollow stud from the face of the gear. Through these holes, oil under pressure is fed directly to the meshing gear surfaces and thence supplies the entire forward gearcase.

The auxiliaries are now arranged so that the twin ignition unit is driven from

the timing case and is entirely separated. The water pump and generator are on the opposite side of the engine and are now completely accessible without disturbing each other. These units are driven by auxiliary shafts provided with flexible couplings. The starting motor is also mounted individually to increase the accessibility. The ignition is the Delco dual system, synchronized, with two spark plugs for each cylinder located in the center of each half of the combustion chamber.

The chassis and general construction of the Stutz car, with very few minor changes outside of those mentioned for the powerplant, remains about the same. The cylinder dimensions are 4% by 6 in., the engine being a four-valve, T-head type. The clutch is a Warner, the gearset is of Stutz manufacture providing three forward speeds. The car is driven through a torque tube with a single universal joint. The gearset is mounted in unit with the rear axle and in order to obtain quietness, all of the constant mesh gears are ground by the Gear Grinding Machine Co., of Detroit. The cars weighs, with the seven-passenger phaeton body, 4010 lb. The chassis wheelbase is 130 in. and the tire size 32 by 41/4 in. all around.



Upper left—An aluminum intake manifold is used in conjunction with the new intake system. Upper right—The detachable cylinder head on the new Stutz engine is provided with internal heavy cast ribs of girder type to offset distortion. Lower left—View of Stutz engine with detachable head removed, giving an insight into the arrangement of the water jacketing. Lower right—Section through the pre-heated intake manifold for the Stutz intake system. This is a portion designed to create the whirlpool action. The manifold has been designed throughout with a sharp slope from the engine

Will Farmers Buy Tractors in 1922?

Sales to be Result of Dealer Effort; Price on Farm Products Requires Use of Tractor; "Dollars and Sense" Needed in Tractor Merchandising

HEN a farmer becomes convinced that a tractor will reake money for him he can and will buy that tractor nine times out of ten. Like all the rest of us, he is looking out for himself and he is strong for anything which will save money on his producing costs or increase his yield so that he has a bigger profit at the end of the year.

This dollar-saving, dollar-making sales method has been the only really successful approach to the farmer since the introduction of modern labor saving implements, but the trend of conditions during the last eighteen months will make it particularly effective in the farm field during 1922. The question of whether or not farmers will buy tractors in 1922 has, to a great extent, been answered for them. The greatest responsibility lies with the dealer who must sell on the basis which his market understands and appreciates, if he would himself make money in 1922.

After talking with a considerable number of farmers and with agricultural experts from many sections of the country, who visited the National Tractor and Power Farming Show at Minneapolis, the factors which have combined to build a substantial tractor market for this year becomes convincingly

apparent.

Farm Prices Require the Use of Tractors

Late in 1920, farmers as a whole, divided themselves into two classes on the question of what to do about the price they were getting for their crops. One class-and by far the largestcalled the drop in prices a "depression" and decided that it could not last. So out of the scrap heap of agriculture they dug antiquated methods and worn out machinery, and with these they set to work to produce a new crop. Any old kind of a crop so long as there was no new investment was their aim. But with the harvest over, they found that they had lost. Prices had not recovered as they had expected—the old time methods and machines had produced only a small crop—and worst of all its was higher than they had anticipated.

The other class, judging the new standard of prices to be a necessary "readjustment," set to work to produce a new crop at the lowest possible cost. While replacements in equipment were few, they made the most of what they had and many of them added a tractor

BY EARL B. STONE

Advertising Manager, Cleveland Tractor Co.

for its ability to work fast and long and well. These farmers got a good crop, paid less to raise it than ever before and, either made money or at least

"broke even" with the game.

Almost any tractor dealer can apply these class divisions to the farmers in his territory. The one class told him that they would wait a year before buying, the other bought last spring and is now ready to add still more up-to-date machinery to their farms. No single year in the history of agriculture has ever given as much widespread impetus to power farming as did 1921 with this convincing record of the failure of old methods and the success of power on the

It's Up to the Dealer

Unyielding circumstances have forced the majority of farmers to recognize the money saving value of farm power. Old methods and old machinery are back in the scrap heap where they belong. Fruitless attempts to control prices have given way to successful efforts to reduce costs. In a single year economic conditions have "sold" power farming more thoroughly than the combined arguments of all the power farming dealers in the world could have done the job.

In this new order of things the tractor dealer has both a great opportunity and a new responsibility. He CAN make money if he WILL.

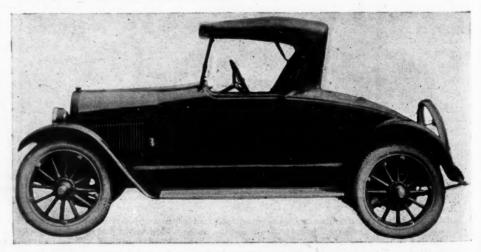
There would be no question as to the brightness of the tractor business in 1922 if every tractor dealer would adopt that idea as the basis of his sales campaign.

The tractor dealer need no longer depend upon more or less odious comparisons with other methods to sell his proposition. The idea of power farming is firmly established. His sales this year will depend upon his ability to apply the general idea in a concrete way on his prospect's farm.

To go after tractor business will be to get it. Early plowing, better seed-beds, and a longer growing season are bound to produce bigger yields. The tractor dealer can get at the job the first day the land is fit, and prove to his prospect in two hours' time that tractor plowing will bring him greater profits at the end of the year.

And the prospect who cannot be closed in the early months of the year is due for a haying, harvesting or threshing demonstration where power and endurance count most of all, and where the tractor again proves positively that it will make money for its owner.

We are all interested in knowing whether or not the farmer will buy tractors in 1922. The farmer says "Yes, if they will make money for me." agricultural leaders in colleges and private organizations agree that "power farming is the only solution to the costto-produce problem" and definitely favor "lower cost" rather than "higher price." The dealer, with these two basic influences favorable to him, can answer the question with a positive "Yes" if he will go out and demonstrate that there is money in the use of the tractor on the



The new Durant four-cylinder Sport Roadster to sell at \$890 just announced

A Seasonal Offer on Maintenance Work

4 Special Spring Offers that SAVE MONEY

OFFER NUMBER ONE—Tuning Met A necessary job at a lew price

- Grind valves
- Remove carbon
 Adjust publ-rod clearances
 Clean and adjust distributor and breaker points,
 Check timing of motor
 Blow out fuel line
 Clean vacuum tank
 Adjust carburetor
- PRICES

OFFFER NUMBER TWO-Lubrication of Car PRICE...... \$11.50 With wash and polish

- Drain oil from crank case

- g. Lubricate universal joi
- Lubricate all wheel bearings
- Fill grease cups

 Spray entire running m
 with Velvo Compound
 (A new graphite penetrating
 moves all equeaks and groam

 Cadeca, windahield and

OFFER NUMBER THREE.

- PRICE\$7.00

- Take up play in front and rear wheel bearings Tighten engine hold-down bolts Tighten shackle bolts
- OFFER NUMBER FOUR. Makes driving SAFE

- for labor, plus cost of lining and

We want to give you immediate service so call Circle 0211 or Circle 1670 in adv ents to bring your car in. This will avoid delay.

RALPH C. ROGNON and COMPANY

The Automotive Service Shope
"An Organization of Skilled Confirmen"

Telephones, Circle 9211

SEE THE 4 SPECIAL OFFERS INSIDE

In six hours we grease, oil, wash and polish your car-ready for MOISELESS use.

Such lubrication means longer life for the car, fewer repair bills.

trating oil to the underneath mechanism of the ear, the fender joints, the windshield posts, the springs and the space between the body and the frame, that cannot be reached with the ordinary oil can and grasse gun. With the use of COMPRESSED AIR we drive a graphite pene-

by Kew York Motorists A Cubrication Service Badly Reded

CARAGE . CAS . OILS . ACCESSORIES

VAD TOWING OF CARS AND TRUCKS. LUBRICATION, INSPECTION, INSURANCE ALSO MAINTENANCE CONTRACTS FOR

WORK, MACHINE WORK AND WELDING. OF MOTOR VEHICLES, GENERAL REPAIR COMPLETE REBUILDING AND PAINTING

We Offer Flat Rate Charges





Spring's Here!

Let us remove all squeaks from your car with our ENTIRELY NEW High Pressure System of Lubrication



AKING maintenance pay involves, among other things, the judicious use of advertising. This may be by letter, newspaper, circulars, telephone or any other medium. The thing to bear in mind is that you must be sure to have something definite to sell in the advertising.

It does not suffice to merely advertise the fact that you have a place equipped with much machinery and many men, or that you guarantee all work done, etc. It is far better to present to a car owner something tangible. Many maintenance departments hope to keep the shop filled by merely asking car owners to drive their cars in for an "overhauling." This is not enough. To the average driver the word "overhauling" means a considerable outlay in money. And, by the way, to do a real job of "overhauling" would run into a considerable sum of money. In these days, we do not speak very much of overhauling cars any more. It has been shown that the

best results are obtainable by selling maintenance in group operations.

This allows a customer to choose one or two or all groups and as a rule a definite price for the group operations has been established so a customer knows exactly what he is going to pay at the completion of the work. Motor Age has from time to time advocated the selling of these operations on the "club breakfast" idea. That is, for so much money a customer can have, say a half dozen specific things done to his car. For additional sums he can have additional work done, and so on. -:--:--:-

One of the best circulars making a direct appeal to car owners at this time of the year which has come to our notice is the one reproduced and which has been prepared by the Ralph C. Rognon and Co., New York. We show both sides of the circular, because we believe there is much that any maintenance department of any dealer's establishment can learn from it.

Note that in the four special spring offers a definite price has been put on the various groups. In the offer No. 1 the man who owns a 12-cylinder car knows just as well what the job will cost him as the man who owns a small four-cylinder car. The appeal made at the bottom of the circular for car owners to arrange in advance for bringing in their cars is a good one, as it helps the organization to route the work properly with minimum amount of time. -:--:-

It will be borne in mind, of course, that the prices shown on this circular have been obtained under the conditions as they exist in this particular shop. Local conditions, equipment, overhead, and other factors must enter into the establishment of flat rate prices for selling maintenance. As a suggestion it might be well for others to try out these prices in their own shops to see how closely they approach the present prices used in such shops for similar operations.

Railroads As

Prospects for Motor Trucks

THE Wide-Awake Dealer Seeking New and Less Conventional Fields in Which to Sell Trucks Will Study the Needs of the Community and Apply Innovations Which Will Result Not so Much in Big Single Orders, But in Sales That Will Continually Draw Attention to His Business. Railroad Transportation Offers Unique Possibilities

By DONALD A. HAMPTON

OTOR trucks will operate even more satisfactorily upon rails than upon streets. That is the theme on which the following presentation is based—being a presentation of general information which the dealer must have before he can successfully meet the arguments of the railroad manager and overcome that harassed individual's objections to a radical change in motive power, even though that change promises a financial improvement.

There are over 400 independent steam railroads, known as

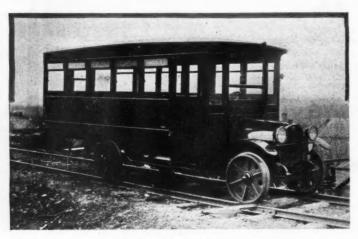


Fig. 1—Paterson body with longitudinal seats accommodating 20 passengers mounted on a Reo chassis. The only alteration was the substitution of flanged wheels

"short lines," scattered over the country; every trunk line has its quota of branches, most of which are operated at a loss; urban and suburban electric roads serve countless localities, often under severe pressure from motor competition, It is safe to say that all of these would welcome some means of transportation less expensive than now in use for passengers. In addition, there is express, baggage, and mail service over the same lines; there are industrial and mining railroads having men and materials to move infrequently, often over long distances; "trouble" cars, inspection, and service cars are needed on both steam and electric roads; there are new railroads being built that require transportation facilities to the rail-end months before the ultimate motive power system is operative. Truly, a wonderful big field and so well distributed that every truck dealer has but to reach out his hand to touch some portion of it!

That the field is ripe is proven by the trolley lines that have ceased operations, by the short lines that have discon-

tinued all service except possibly freight, by the trunk roads which seek to abandon their branches, by the attitude of finance toward roads in these classes.

The motor truck, adapted to run on rails, is the logical solution of the problem—the one car which today can be run at a profit on light traffic. Trucks can be arranged for railroad purposes and, mile for mile, load for load, will operate more economically than upon the highway. The first cost may be stated in terms of the body desired because the chassis cost is but little higher in one case than the other, when allowance has been made for the parts replaced by rail equipment.

Will They Stand Up?

Almost the first argument the dealer will have to combat is that "they won't stand up". Well, how many men buy a truck expecting it to last a decade or more? Not one. They are content to buy a machine that will do their work now, at a profit, and will stand up without overhauling? Do they not spend something like a month a year in the repair shop at a cost that would buy a gasoline car? How much less than \$500 does it cost to paint the ordinary passenger coach? And yet this same expensive, "rugged," rolling stock is used to haul the same paying load that could be handled as well by a motor truck on the line—because the motor truck can handle all the traffic there is. The writer knows of several 1½-ton trucks that have run over 200,000 miles under such traffic conditions and at a cost of \$1 per thousand miles for parts.

Precedent

"If this plan is so feasible, why is it not more generally adopted?" There are several hundred trucks running on rails at this time but the field is so broad that the average person

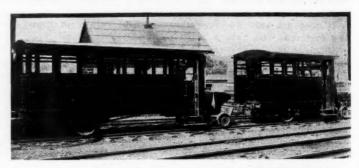


Fig. 2—A dealer in eastern New York fitted these two trucks for railroad service. Some interesting statistics are quoted in this article as to cost and revenue in operation

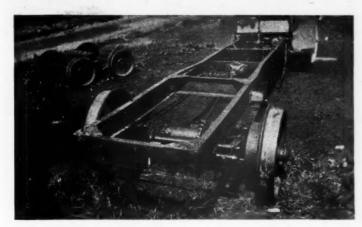


Fig. 3—In fitting a truck for railroad operation a long body often is required and the frame must be lengthened to avoid excessive overhang. The front truck is shown at the left

rarely sees these cars. The number is rapidly increasing, for it is now possible to buy the necessary railroad parts of the proper materials, machined ready to apply to standard trucks whereas formerly in each case it was necessary to go through with engineering, pattern, and casting work and experiments, which made the task prohibitively expensive and unsatisfactory. The degree of motor truck perfection we now enjoy is a strong factor in the success of modern installations.

Costs

Costs must be divided between the chassis, the body, the rail-road equipment, operating costs, etc., and these in turn subdivided. Owing to the unsettled prices of this period and the varying scale for labor in different sections, no hard and fast prices can be stated. It is the purpose of this article to state the prices in connection with several cars at the time of delivery in the particular locality used and to let the reader base his plans upon these, graduated to his local conditions at the present time.

Bus bodies have been used on many trucks adapted to railroad runs. That in Fig. 1 is a Paterson vehicle body with 20-passenger longitudinal seats upholstered in imitation leather. In 1918 this body cost about \$800. It was put on a Reo chassis that was not altered in any way, except for the substitution of iron for wood wheels in the hubs. As shown, this car is a good example of individual conversion—patterns and moulds and castings being made locally at almost double the cost of the proper standardized parts that were later supplied. After 9000 miles of running, chilled face wheels were applied and a four-wheel truck put in place of the front axle and two wheels. This later equipment is still in good shape and the car is making over 100 miles a day on this Georgia road. With a trailer of equal capacity, the gasoline consumption has averaged one gallon to 15 miles.

Nine motor trucks have been sold to the Hetch Hetchy R. R. in the Sierra Nevada mountains. Both in the construction work and subsequent operation, these cars are supplanting the steam equipment. The chief engineer reports, "We find this equipment extremely satisfactory where conditions do not warrant the operation of steam locomotives and cars with their attendant crews." Pierce-Arrows, Whites and Packards are used and have shown an average total maintenance and operating cost of 18¼ cents a mile, running as low as 12.9 cents on one of the cars. This line has curves as sharp as 30 deg. (190 ft. radius) and grades as heavy as four per cent, showing that trucks stand up well in all respects under the severest railroad conditions. Some of these cars have been in service about six years.

The two cars shown in Fig. 2 were sold to a 15-mile steam road in Feb., 1921, by a dealer in eastern New York. These are the third and fourth cars sold to the same road. Figures for the smaller car, which is a Reo, and cost approximately

\$4500, with full railroad equipment, show that in six months it ran 15,000 miles with the following charges against it: \$478 for gasoline, \$120 for oil and miscellaneous supplies, \$1230 for driver and helper, \$86 for repairs, and \$750 for depreciation figured as a total in three years. The passenger receipts for the same period were a little over \$6500.

Statistics of this sort might be continued indefinitely but enough have been given to enable the dealer to strike an average for his own needs. The dealer may want to know the cost of making the changes himself. He knows what he can sell his chassis for, what he can allow for wheels or front axles or steering gear, tires, fenders, etc., which he may remove and put in stock. He can quote close figures, for there is nothing on the railroad to take as a trade-in.

Bodies may be purchased all the way from \$500 to \$5000, depending on the quality, size, and construction. The very highest grade are of steel or composite construction, are suitable for mounting on the heaviest of motor trucks, and weigh as much as the bodies on one-man street cars; they have comfortable cross seats upholstered in rattan, leather, or plush. At the other extreme are the bus bodies seating from ten up, light enough to be lifted by two strong men, and having excelsior-stuffed longitudinal seats. The cost of mounting such bodies on chassis is from \$40 to \$100—this being taken from a score of bodies mounted without any facilities other than what may be found anywhere, at any time, and includes such fastenings and fittings as are not a part of the body itself. Body building plants are so numerous that it is best to consult them before paying freight long distances.

Railroad wheels may be purchased from those who specialize in this line and at prices from \$40 up, according to diameter and material. The driving wheels under the cars in Fig. 2 are of iron with ground chilled treads; their diameter is 33 in.—30, 33 and 36 in. are standard railroad diameters. Besides the iron wheels, wheels of cast and rolled steel are

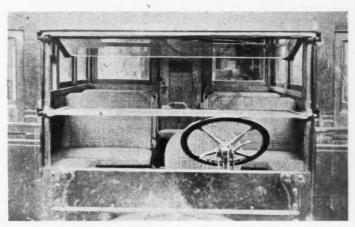


Fig. 4—This the interior of one of the cars shown in Fig. 2. Standard width cross seats accommodating 12 persons and longitudinal seats carrying 9 persons are used

used. Steel wheels cost considerably more than iron ones; they possess a greater rail adhesion; they may be made lighter in weight with equal strength, though the margin of safety is so wide that practically any wheel that can be cast is strong enough for any truck load that can be put on it. Wheel founding is a special line of work—it cannot be carried out in jobbing foundries because entirely different mixtures and special equipment are necessary to produce a wheel that will roll up a big mileage. Wheels of ordinary gray iron (and wheels pressed out of sheet steel), will wear out almost as fast as rubber tires on the road.

For fast schedules, greater riding comfort, bigger load capacities, and a wider margin of safety on curves, the front axle of the motor truck should be removed and in its place a four-wheel swivel truck applied. Both of the cars in Fig. 2 were supplied with trucks by the dealer (and the parts removed were added to the supply kept in the maintenance station for highway trucks). These swivel trucks cost from \$250 to

\$450 and weigh from 800 to 1600 lbs, according to the intended load and the presence or absence of brakes. Front wheel brakes are essential where the schedule demands that station stops be made quickly, and for emergency stops.

Installation

Assuming that the garage man has made a railroad sale and that the various units have arrived, what shall be his modus operandi? Fig. 3 is a partial answer to this question. In this case a longer body was desired and, to avoid excessive overhang, the chassis was lengthened-the extreme cross member and center bearing added are plainly seen. The wood wheels have been dismounted from the hubs and metal ones put in their place, using only the bolts that were taken out. Ordered for a known truck or axle, the wheels come so that they suit the standard American track gage of 561/2 in. without any fitting or shimming. The body will next be mounted and all weather-proofing, lights, signals, couplings, etc., be installed while the car is in or about the shop.

The front truck is shown at the left-it is to be towed to the railroad and there applied through the medium of the spring clips. This truck is left until last for the car is to be driven under its own power to the railroad siding, running there on the flanges of the rear wheels and guided by the original front wheels. If there are to be front wheel brakes, they are connected up afterwards, the method of braking being to use the steering wheel and transmitting the force through cable or connecting rod.

Maintenance

Maintenance should be less for the rail car than the street truck carrying the same load and making the same mileage. To be conservative, the salesman could quote fleet owners' records for the same truck. But, under the maintenance account, there must be included tire expense as one of the three big items and this item does not exist in connection with the railroad car!

An uninformed person will state that the jar on steel rails will shake the car to pieces in short order or else keep someone continually busy putting in new parts. The argument advanced is that the rubber tires cushion all parts of the mechanism. As a comparative statement this is false and may be proven so by riding a few miles over good roads on rubber tires and an equal number, metal to metal, on rails. In one case, the occupant is compelled to "hang on" in passing around corners, in negotiating a short section where the top surface is broken, and bouncing over the numerous gullies

and humps that do exist even in a few miles of improved

Fig. 6-Service truck mounted on flange wheels for duty on an electric line. The dealer has sold two more trucks to this company and finds he gets valuable advertising out of this application of the truck he sells

road-while on the railroad there is not once in a stretch of 20 miles when the speed need be lowered to 30 or the observer has to brace himself. If the "cushioning" effect of rubber goes no further than this, the railroad car is amply safeguarded against shock—one doubter who was quickly converted into a booster by such a test remarked that if he had closed his eyes he would have sworn that the rail car was on rubber tires and that the street truck had metal wheels on a springless body. A "bump" of one-half in. height would be enormous for the railroad car to encounter-this bump would be "almost level" for the street truck which is forced to drop into any number of deep holes and bump out of them again in very short distances.

Speeds, Wheels and Ratios

The speed of the railroad car is a buyer's selection. By changing the gear ratio and using different sizes of wheels, any speed within reason may be obtained. Of the two cars shown in Fig. 2, the smaller one makes 42 m.p.h. at full throttle opening and the larger one 32 m.p.h.-the smaller car was put into service on a scheduled run of 15 miles to be made in 35 minutes, including six stops on the way, and has been on this run daily up to the time of writing. Other roads would have other requirements, which are possible to meet. The writer has encountered the type of manager who insisted that 20 m.p.h. was "as fast as anything on wheels ought to go" and who was immensely pleased with a 21/4-ton truck governed to 17 miles an hour.

Aside from the light, fast type of trucks, the change to railroad wheels lowers the speed, because 33-in. wheels are the largest conveniently used in many cases whereas the truck equipped for the street has 36 to 40 in. tires. If this speed reduction is unsatisfactory, it is generally possible to secure a higher gear option without extra cost. One dealer recently put a Gramm truck on a railroad but instead of the usual 7.75 reduction in the Sheldon worm drive axle, he had installed gears of 4.5 reduction, adding 12 miles an hour to the speed-and there is plenty of power there yet as proven by the 20-ton loads that the truck starts and hauls.

Unnecessary speed should be avoided. It is a fundamental of engineering that wear increases rapidly above a certain speed and that a running speed 30 per cent less than the maximum allowable will result in a higher percentage length of life. Engine governors should never be removed or tampered with. If the road speed desired cannot be obtained with the engine running at the factory speed, wheels or gear ratios should be changed or, in the case of chain drive cars, the driving sprocket should be enlarged.

Comfort

Mention has already been made of the difference between riding comfort on railroads and in trucks on highways. The latter is about the same as jitney and bus riding, except on the smoothest of streets. Nothing is done to hamper full play of the best automobile springs, in the converted car, and their softness coupled with a steel roadway of an unbroken level make the rail car ride as nicely as the best of street cars. Fig. 4 is an interior view of the cars in Fig. 2, showing the standard width cross seats for 12 persons and longitudinal seats for nine; the truck windshield is built into the car body, the side windows are movable and held in place by Edwards safety latches.

Cross seats are more comfortable for long distance riding. But the railroad car rides so easily and without the lurching inseparable from bus transportation, that longitudinal seats can be used where desired and patrons soon forget the "black eye" which such seats have received through miles of highway discomfort.

There are other little points of comfort which the dealer may stress to the prospective customer. No smoke, no cinders, none of the unexpected happenings of the electric flame. In cold weather, the car is adequately warmed from the exhaust which is by-passed ahead of the muffler and carried around the sides just above the floor and where it is protected by a mesh or wood duct covering. Metal wheels protect the passengers from jerking when the clutch is let in suddenly, as in starting, for their ratio of adhesion is so much less than rubber on pavements that the wheels spin when trying to start too fast.

Electric and Public Service

Besides the passenger service on steam lines, which we have considered chiefly, there is the almost untouched field of electric and electrified roads. Trolley roads serving a community that warrants only infrequent, small cars can be operated more cheaply by gasoline rail cars, abandoned lines no longer in condition to support heavy electric cars can be re-opened to gasoline cars without track rebuilding, electric lines require service cars that can run independently of power lapses, gasoline express cars can be run over street car lines. One of the latter is shown by Fig. 5-it was sold by garage interests to an expressman who arranged for two trips a day to a village at the end of the road, ten miles distant. In this case, demountable steel flanged tires are applied to the wheels in place of the rubber tires. The divided rear axle and the

swiveled front wheels depart from street car practice most decidedly-this is noticeable on curves, as the one of 30 ft. radius shown, where all four wheels are in rolling contact with the rails-on this same curve, the total amount of slipping for each wheel on a rigid axle is over six feet! The saving in power and the increase in traction thus greatly favor the

gasoline car.

It is said that any good motor truck will haul a trailer load equal to its own loaded weight. This is more than true on the rails. It increases the pay load with very little increase in fuel or labor costs. A number of Fords have been sold to roads that put passenger bodies on the trucks and hauled freight matter on a flat car coupled behind. Railroad grades



Fig. 5-A dealer sold this truck to an expressman who makes two trips a day on the railroad right-of-way to another town ten miles distant. The divided rear axle has an advantage over the solid axle commonly used on street cars

seldom exceed three and four per cent and such grades are well within the capacity of trucks hauling an equal-weight trailer.

A typical service car for electric roads is shown in Fig. 6. This one was sold three years ago and is highly prized by this road near Montreal. The same dealer has sold two others since, besides a passenger car, and has found that these machines are a continual advertisement for the truck. equipped for line work, this rail car has a Trenton tower that raises to a height of 20 ft., tool cribs, and seats for workmen; it is fitted with an auxiliary transmission so that the ear can run either way at high speed and thus clear to the nearest turnout for the passage of regular traffic.

Some Good Reasons Why Tractors Should Have Springs If Used on Hard Ground

E DITOR, MOTOR AGE, I read with great interest an article on the possibilities of using the gasoline-kerosene tractor as a heavy transportation unit in nonfarming districts. Perhaps a few remarks from a maintenance mechanic who has run up against some of the problems presented by this very phase of the use of the tractor will be of interest to your readers.

There are wonderful possibilities in the use of tractors for this purpose, but with the present design of tractor it is not as practical as some of us would like to see it.

First, there is the problem of unsprung weight. A tractor of two-plow capacity weighs somewhere near 3000 lbs., and most of them are not designed to be used anywhere the ground presents a hard, unyielding surface. In fact, my experience has been that a tractor soon shakes itself to pieces in use on a hard road, even where no lugs are used for traction, especially if the speed be over two miles per hour. Even at that low speed the life of a tractor is not more than half that of one used in soft soil. Another result of this evil, or rather fault in

design, is that the constant jolting is anything but beneficial to the person operating the tractor. If you don't believe this, try driving one of the tractors over three miles of hard road, and you will find out.

I admit that rubber tires are a great help in alleviating this trouble but they do not go far enough. The Italians are making a tractor, the F.I.A.T, which is much like the Fordson, but the ones I saw when there were mounted on spring frames, and were not hard riding on a hard road. Later models may have changed, for it was in 1918 when I saw them. The Italian engineers told me that the question of mounting the tractors on springs would seem to them very important in designing a tractor that would be long lived, and they also said that this was the reason they had for dissatisfaction with the American tractors. They had ample opportunity for observation; for they bought 7500 during the three years I was there.

Another thing wrong with the tractor for road transportation is that it not as near fool-proof as it could be. It is true that there are great strides made every year toward this, but it is still possible for an ignorant driver, such as we have to depend upon for pilots in this work, to ruin a good tractor in a short time. I will not try to suggest a remedy for this, because there are several that are obvious.

I can see in my mind's eye some designing engineer rising up in his wrath to say sacrastically, "If you know so much about it, please suggest a remedy." Very well, if I must, here goes! Let each designing engineer leave his drawing board and his mathematics in the office. Then let him put on a pair of overalls and drive a tractor in some railroad yard, or else down a hard macadam road on a hot day in July, and let a prize be awarded to the man who sticks to the tractor for ten miles. I'll bet a dollar to my next year's income tax that the prize would never be awarded. The hair of the dog is sometimes good for the bite!

I hope the foregoing may be of interest. Sincerely yours, F. L. Whaley, Iowa

When an Electrical Problem on Any of the Cars Described Confronts You Refer to This Index The following electrical systems have been described in previous issues:

Car	System	Issue	Car	System	Issue
Ford	Ford	Nov. 10, 1921	Overland	Auto-Lite	Dec. 29, 1921
Dodge	North East	Dec. 1, 1921	Studebaker	Wagner and Remy	Feb. 16, 1922
Buick 4	Delco	Dec. 15, 1921	Chevrolet FB & 4-90	Auto-Lite and Remy	Mar. 9, 1922
			Maxwell 1920, '21, '22	Simms-Huff & Auto-Lite	Mar 23 1922

Remy Electrical System on

1921 Oakland, Model 34-C 1921 Oldsmobile Six, Models 37-A & B Other Oldsmobile Described in a Later

A Simplified Analysis That Will Greatly Assist in Service Work

ARTICLE EIGHT of a Series by A. H. PACKER

HE electrical system on the 1921 Oakland and 6 cyl. Oldsmobile cars is one that is rather simple electrically, while the various units are so designed and installed that they may be easily removed for inspection or repairs, this being a feature that is appreciated by both the customer and the service station.

Wiring Diagram

The wiring of the cars is shown in Fig. 1 where all of the circuits both external and internal can be traced, with the possible exception of those through the lighting switch, which will be explained, as they vary with the operation of the lighting and ignition buttons. The Oldsmobile also has a tonneau light connected at the battery terminals.

The starting meter circuit is from the battery to the starter switch, through the switch to the starting motor, and through the motor windings to ground or the frame of the car and back to the battery.

The generator charging circuit after the cutout points close is first to the left hand terminal of the ammeter, then through the ammeter and from the right hand terminal to the starting switch, and through the heavy cable to the battery, through the battery to the frame of the car and back to the generator.

Current for the lights comes from the starter switch to the ammeter and through the ammeter to the center or "BAT" terminal on the ignition and lighting switch, then when the lighting button is turned to the "DIM" position the switch connects the "BAT" terminal to the "REAR" and "S. HEAD"

terminals which send current to the tail light and the small bulbs in the head lamps. When the switch is turned to the "ON" position the "BAT," "REAR" and "L. HEAD" terminals are connected which sends current to the tail light and the large bulbs in the head lamps.

Current for ignition is obtained when the ignition button is turned to either of the "ON" positions, as they both produce the same results, the "BAT" and "IGN" terminals being connected allowing current to flow to the ignition coil then through the ballast at the top of the coil, and through the magnetic winding or primary, then out to the interrupter and

across the contacts to ground or the frame of the car. The opening of the interrupter contacts operates to produce a high voltage in the fine winding in the coil, which sends the sparks through the distributer to the proper spark plug.

Locating Starting Trouble

Trouble which affects the operation of the starter is just as likely to be in the wiring or connections or battery as in the starting motor itself so that it is well to be sure of the location of the trouble before trying to correct it. If the lights are turned on and watched carefully, their action will usually indicate the nature of the trouble.

Lights going out when the starting switch is operated usually shows corroded contacts at either of the battery terminals or where the battery is grounded to the frame of the car.

The exact location of trouble of this kind can be determined in two ways, first by holding the starter button down for a short time and then feeling of the battery terminals and the ground connection to see if they are getting warm, as current flowing through resistance produces heat.

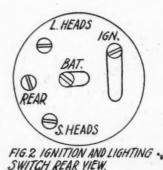
A more accurate method is to use a voltmeter with about a 0 to 15 scale, the wires from the meter being connected across the suspected poor connection while the starter switch is operated.

If the connection is O. K. there will be either no movement of the voltmeter needle or else a barely perceptible movement, but if the contact is poor there will be a considerable reading, perhaps a volt or two, or if the contact

is very poor the reading may be even higher. In this way the various parts of the circuit can be tested until the bad contact is located.

Lights staying the same when the starter switch is operated shows that the circuit is open and that no current is flowing. This trouble can also be located with the voltmeter, one wire from the meter being connected to the frame of the car while the other is touched to various parts of the starter circuit, while the switch is held down.

For example let us assume that with the free wire from the meter on the live battery terminal, that we get a reading of 6 volts, and



that when the wire is moved to the battery side of the starter switch that the reading there is also six volts.

This shows that the circuit is all right as far as the switch. Now let us assume that with the starter switch still held down that there is a six volt reading on the battery side of it but no reading when contact is made at the motor side.

This obviously shows the trouble to be in the switch, and it can then be removed with the absolute assurance that we are not guessing at the location of the trouble, but absolutely know where it is.

If, however, the circuit had given us readings all the way up to the starting motor, and yet there was no current flowing through the motor, it would appear that the circuit was broken in the motor itself.

Open circuit in starting motor is usually due to the brushes being worn down so that they do not touch the commutator. When this occurs the commutator is usually rough and burnt due to long service and the motor should be removed, the commutator turned down and new brushes installed.

Lights getting very dim when the starter switch is operated may indicate a discharged battery which can be checked with a hydrometer, a reading of 1280 showing that the battery is charged while a reading of 1150 shows it to be discharged, intermediate readings showing partial charge.

Another check can be made with a low reading voltmeter, say with an 0-3 scale, readings being taken at each cell of the battery while the starter button is being held down.

Cells showing a lower voltage, or where the reading rapidly drops to zero are shorted, the separators having rotted away

until the positive plates and the negative touch each other. This condition may also result in a shorted cell showing a reversed reading while current from the other cells is flowing through it.

If battery is all right the lights getting dim may be due to a short or ground in the starting motor itself which while drawing a heavy current does not produce much torque or turning action.

This condition can be checked by connecting a high reading ammeter, say with either a 0-350 or 0-500 scale in the starter circuit so that the starter current will go through

Most engines when free to crank easily require a starting current of about 150 amperes so that if the current is much in excess of this, say 300 or 400 amperes, and the starter will not crank a free engine, it shows trouble in the starter itself.

Removing Starting Motor

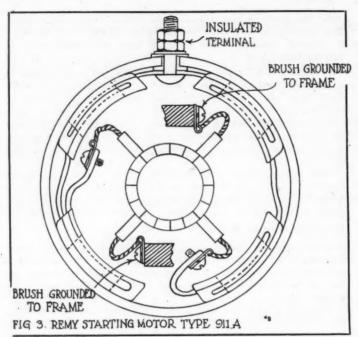
Should it be necessary to remove the starting motor it is only necessary to remove one bolt or cap screw. This is really a combination grease cup and cap screw, which is located on top of the flywheel housing just over that part where the starter attaches.

With this screw removed the starter can be pulled forward, for it is installed so as to have a sliding fit between the casting at the drive end and the bore in the flywheel housing.

Internal circuits of the starting motor are shown in Fig. 3 where it will be seen that the current divides at the terminal, part going through the two coils at the left and part going through the coils at the right.

After going through the field coils the current goes to the

Fig. 1—Wiring Diagram of 1921 Oakland Car, Model 34-C BACK OF COWL BOARD TAIL IGNITION AND LIGHTING SWITCH HORN HORN BUTTON IGN. BAT. PLUGS DISTRIBUTOR L. HEAD. S. HEADS REAR AMMETER IGNITION COWL LIGHT-COIL BATTERY SWITCH CUTOUT INTERRUPTER GROUND ON FRAME OF CAR GENERATOR MOTOR



upper left hand and the lower right hand brushes and through the armature to the other two brushes which are grounded by screws that fasten to the end bracket of the motor.

To test for grounds in the motor the ground brushes should be disconnected or lifted from the commutator, and a 110 volt test line with a lamp in series with one side of it, used, with the test points connected from the terminal to the frame of the motor.

If the lamp lights up the motor is grounded but if the lamp does not light the circuits are not grounded. If the test lamp lights up but the location of the trouble is not evident, the exact location can be found by connecting a six volt battery to the suspected coil and the frame of the motor. A heavy current will flow causing a curl of smoke to rise at the point where the coil is grounded.

Generator Circuits

In Fig. 4 the internal circuits of the generator and cutout are shown, and it will be seen that the right hand brush is grounded while the left hand one is insulated and is connected to the "GEN" terminal of the cutout which is mounted on top of the generator.

The field circuit is from the third brush at the top of the commutator to the field coil at the left, through it and across to the right hand field coil and then to the insulated part of the thermostat.

The current then goes across the thermostat contacts to the lower part which in the sketch is marked "thermostatic metal" then through the tubular rivet to the ground or frame of the generator. The field is thus connected from the third brush to the ground brush, the thermostat being in series with it.

Thermostat Action

It is a well known fact that a battery in cold weather needs more charging current than in hot weather, and it is also a fact that a generator that would overheat if generating 18 amperes in hot weather, can do so without bad results when the temperature is low.

It is for this reason that the thermostat is used for it allows the generator to charge the battery at a high rate at first and when the heat from the generator opens the thermostat contacts, the flow of field current through the resistance reduces its amount and therefore the generator output. The usual setting of the generator is therefore such as to give about 18 to 20 amperes cold or 12 to 14 amperes hot.

The action of the thermostat is accomplished by the use of a strip of metal composed of two different materials which expand with heat at different rates. Such metal is known as bi-metallic strip, or thermostatic metal, and the piece in the sketch which holds the lower contact is made of this material.

When this strip is heated it bends in such a way as to open the contacts, so that the current from the field coils which formerly went across the contacts to ground, now has to go through the resistance which is wound on the mica strip. This weakens the generator, and causes it to reduce the charging current that goes to the battery.

A burnt out resistance will not affect the output of the generator at first but as the machine warms up and the contacts open, it has the effect of entirely stopping, instead of merely reducing, the charging current.

As the machine cools down again, the points may close and the generator charge again, so that if the action is understood the nature of the trouble is easily detected by the symptoms just described.

Cutout Circuits

The left hand main brush in the generator connecting to the "GEN" terminal of the cutout, sends current through the heavy or series coil of the cutout and through it to the frame of the cutout to which the two cores of the coils are attached. Current then goes through this frame to the shunt coil and through it to the cutout base which is grounded by being attached to the generator.

The current in the shunt coil, when strong enough, closes the cutout contacts and allows current to flow out to the ammeter through which it goes to the battery, as shown in Fig. 1.

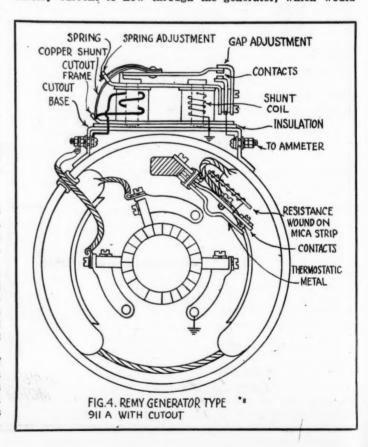
Locating Generator Trouble

If the ammeter does not show charging current when the engine is running, the lights should be turned on to see that the meter shows discharge, for it is possible that the meter is carrying current but not indicating.

If the meter shows the current used by the lights, it would then be well to remove the wire from the "BAT" terminal of the cutout and flash it quickly on the frame of the generator. If it flashes it shows the connection from the ammeter to be all right and that the trouble is evidently in the generator or cutout.

Testing Generator

The cutout can be eliminated from the circuit by connecting a wire from its "GEN" to "BAT" terminal. This should cause battery current to flow through the generator, which would



show a discharge current from 15 to 20 amperes on the ammeter. If the engine is now started this discharge current should decrease to zero and become a charge current, the output to battery being from 15 to 20 amperes.

A shorted armature or a grounded armature will often have the effect of reducing the discharge current to zero as the engine is speeded up, but further increase in speed will not show any appreciable charging current.

An open field circuit will have the effect of preventing any change in the discharge current so that the ammeter continues to show a heavy discharge no matter what the speed of the engine is.

If the symptoms seem to indicate an open field circuit it is quite possible that the trouble is really in the thermostat, as the contacts may not be touching each other with enough pressure to make a good connection. To eliminate the thermostat from the field circuit it is only necessary to hold the blade of a screw driver so as to touch the frame of the generator and the screw that fastens the field lead to the thermostat.

This will complete the field circuit even if the thermostat points do not touch, and the generator should charge. If it does not do so it indicates that the trouble is elsewhere.

If the generator charges when the cutout is shorted, but will not charge by itself, it indicates either that there is trouble in the cutout or that there is a poor connection in the field circuit of the generator.

To test the generator, the engine should be run and a voltmeter connected from the frame of the machine to the "GEN" terminal of the cutout.

If a voltage of eight or more is obtained, there is no excuse for the cutout failing to close its points, and if it does not operate, either the spring is too stiff, the air gap too large or the shunt coil is open.

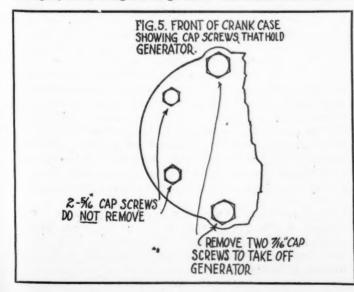
To test for open shunt coil in the cutout, the wire should be removed from the "GEN" terminal of the cutout and one lead from the voltmeter connected to it, the other voltmeter lead going to this same terminal from which the wire was removed.

This will put the meter in series with the circuit of the shunt coil of the cutout, so that if the meter does read, it shows the shunt coil is all right.

Two troubles that occur occasionally in cutouts are, first, the grounding of the cutout by the use of too long a screw when attaching the cutout cover, or else by the use of the right screw but omitting the lock washer; second the copper shunt shown at the left in Fig. 4 will sometimes be found to be burnt out which renders the cutout inoperative. These conditions should therefore be watched for and guarded against when working on the generator.

Removing Generator

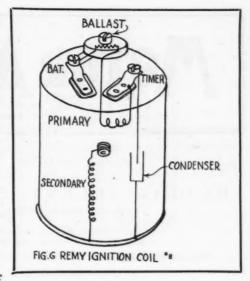
Should it be necessary to remove the generator it can be easily accomplished by taking out the two cap screws shown in Fig. 5, these being the large ones. The small ones hold the



front of the crank case and should not be removeà.

In replacing the generator one or two paper shims or gaskets should be used for two reasons, first to make the connection of the generator flange and the engine oil tight, and second to space the generator back a little so that its shaft will not rub against the front of the crank case.

Also in replac-



it should be carefully placed in position by hand, as the shoulder on the generator flange is just a nice fit in the bore in the crank case, and if not properly placed, the drawing up of the two large cap screws will break off one of the lugs on the front end of the crankcase.

Locating Ignition Trouble

If the engine will not run and it is found that there are no sparks at the plugs, the ammeter should be watched to see that the battery current is going to the coil and the interrupter.

With the ignition switch turned on and the starting motor cranking the engine, the closing and opening of the interrupter points should make the ammeter show first about five amperes then zero amperes, or if the engine is being cranked rapidly the ammeter hand will neither have time to go up to five nor down to zero so that the reading will be about two amperes with slight quivering or vibrating action.

If this make and break action is all right the next thing to check for is a shorted condenser, and to do this the interrupter points should be held open with a match or piece of paper and the ignition switch turned on and off. As this is done the ammeter should be watched and if a slight movement is observed it shows the condenser is defective.

As the condenser is located in the coil (see Fig. 6) the practical repair would be to put in a new coil. If the condenser seems to be all right but still the coil does not give much of a spark when the interrupter points open, the trouble is probably in the secondary winding of the coil and as this cannot usually be repaired, this also requires a new coil.

If a steady current of about five amperes is obtained on the ammeter while the ignition switch is turned on and the starter is cranking the engine, it indicates either that the interrupter points are not opening or that the live interrupter point is grounded or that the wire from the coil to interrupter is grounded.

If no current is seen to flow to the ignition coil while the starter is cranking the engine it shows an open somewhere in the ignition circuit which can best be located by using a six volt trouble lamp connected from the frame of the car to various parts of the ignition circuit. If we make it thorough by starting at the battery and working along the ignition circuit until the interrupter is reached, it will be found that the open circuit exists between the last place where the lamp would light up and the first place where it failed to do so.

Removing Ignition Unit

If it seems desirable to remove the interrupter distributer or the ignition unit as it is sometimes called, it can be done by loosening the set screw in the engine just below the ignition unit casting.

Before lifting the unit from its socket, however, the location of the distributer arm should be watched to avoid getting the engine out of time. When the unit is replaced it is only possible to put it in one of two ways due to a tongue and groove arrangement on the shaft, but of course it is necessary to get it in the right way in order to have the spark at the right cylinder.



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Mallers Building, 59 East Madison Street, Chicago

BUSINESS DEPARTMENT E. E. Haight, Manager

EDITORIAL

Clyde Jennings, Managing Editor B. M. Ikert, Technical Editor

DETROIT OFFICE J. Edward Schipper WASHINGTON OFFICE 816 Fifteenth St., N. W.

BRANCH OFFICES

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The Basis of Credit

HE basis on which credit is established is considerable of a mystery to a good many automotive dealers. Recently a dealer commented rather bitterly on the fact that his credit was limited to a sum that he thought entirely unfair and he did not understand why this was the case. His chief contention was that he had always paid all of his bills and he thought that alone entitled him to a much higher rating. This man, as it happens, is considered unprogressive by his associate dealers. It did not occur to this man that his failure to use modern business methods might affect his credit.

Here is the other side of the story. The following paragraph is taken from an address to a body of dealers by a credit man who was offering his services to these dealers. Not all of them were using the credit he offered, but he had the indorsement of the distributor at the head of the group. He talked rather plainly, and among other statements were the following:

"We consider, when we receive a financial statement from a dealer, a lot of things besides your liabilities and We consider, among other things, your sales ability. We consider the manner in which you run your business. We consider your prospect file and whether you use it; because no man in the automobile business

is going to make a success unless he knows the possibilities of his territories and works them. 'A nose for news and the legs to go after it,' is a test for a news man and we think that a 'Nose for prospects and a willingness to interview them' is a good asset for an automotive dealer.

"A distributor recently had his dealers on the carpet to learn how much each dealer knew about his own business. One dealer, who said he did not have a prospect in his whole territory—not a chance to sell a car there, —went home after the grilling, combed his territory and sold 125 cars."

So when you, as a dealer, ask for a credit rating just keep some of these points in mind.

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Leading the Way

HE following item is taken from the Summary Column of the Chicago Journal of Commerce of recent date:

U. S. Department of Labor declares automobile manufacturers have blazed trail to normalcy not only for themselves but also for steel, paint and varnish, tire and kindred industries.

The survey referred to pertains more to the manufacturing unit of the industry, but it is just as true of the dealer and maintenance units. We venture the prediction that there is not a community in the country where the automotive group-dealers in vehicles, accessories, supplies and maintenance—are not the leaders in the local prosperity.

The effort of the Quincy, Ill., Automobile Trade Association in assembling the payroll and other business figures for that community for the consideration of the men in other lines of business, was a "knockout" to a good many of these business men, who had thought all of the time that this industry was a thing apart from that community and that it benefited only Detroit, Cleveland and a few other manufacturing centers.

The architectural department of Motor Age has been busier this year than ever before. From practically every state have come inquiries during the last few weeks as to how best to build a dealer establishment of some sort. These inquiries range from the small four or five man maintenance establishment to the distributor plant. Later word from these inquirers indicates that they are going ahead with their building plans. These buildings, of course, aid business in the community where they are built.

How many business men have ever taken the trouble to review the business activities in behalf of the auto-motive vehicles in their own community? The ever increasing number of vehicles in any community means more building, more maintenance work, better shopping and generally more business for the progressive spirits of the community. The automotive vehicle, however, does spell ruin for the merchant or other business man who is slow enough to go on the old theory of business that he can sell to the people of his community, because they cannot afford to go elsewhere to buy. The merthey cannot afford to go elsewhere to buy. The mer-chant who holds his own with the best trade in his community today is the man who competes with the merchants of a community many times larger than they were a few years ago.

How many men, who are doing business in a community where the prosperity is due to hides, lumber. paint, varnish and similar raw materials, have figured how much of the trade they enjoy they owe to the auto-

motive industry?

We venture to predict that the merchants of many small communities would be amazed if they would inquire of the factories in their neighborhood as to what extent the prosperity of these factories depended upon the automotive trade.

The time is ripe for local automotive associations to assemble their total figures for their community and impress upon all business men of that community, that the automotive industry is the leader in the return to normalcy. There never was a better chance to establish the leadership that is due the industry.

The Transmission Brake

ANY questions have been raised as to the efficiency of the transmission or propeller shaft type of brake. It is not within the scope of MOTOR AGE to enter into a lengthy discussion as to the design of this type of brake, but there are a few things that might be said about it from the standpoint of the maintenance man and car owner.

In sections of the country where the roads are level, little difficulty is experienced with the transmission type of brake so far as its ability to check the speed of the car is concerned. However, in mountainous country there is a different story to tell if we are to believe what the dealers and maintenance men who operate in those sections tell us.

The transmission brake of necessity must be relatively small and if much use of it is made on long grades it easily burns out. The thought is also set forth that should the pinion shaft or the pinion itself break, there is only the emergency brake left to hold the vehicle. Opinion seems to be prevalent that the average emergency brake is not very efficient when it comes to holding the car on a long hill. Car owners will not always use the engine as a brake and consequently the service brake is called upon for much unnecessary strain. All of which makes the maintenance problem on cars more difficult in the mountain states.

One of the answers seems to be to build the transmission brake as large as possible and secondly, to provide the best possible emergency brake on the rear wheels. Sometimes the emergency brake is fitted on the propeller shaft, but in either case it should be as large as possible.

A Thing of Value

A CHICAGO automobile dealer who seems not to have realized that his membership in his trade association was to him a thing of value to be used when needed, had an experience recently which ought to make an ardent believer of him. He had been in business many years, had a clean reputation and was considered a successful business man.

One day the police discovered in his place of business, an automobile which investigation showed had been stolen from a distant state. The dealer was dumbfounded. He knew the man he bought the car from, he had a bill of sale, and his close examination had failed to show the skillful manner in which the engine number had been changed. The seller appeared, corroborated the dealer's story and volunteered to aid in tracing the car back to the thief, if possible. The dealer was willing to give up the car and take his loss. He thought surely the police would accept his explanation of the transaction which had been in good faith on his part and turn their attention to the effort to find the thief.

But, no. Acting by the letter of a clause in the city license for dealers, the police closed his place of business. He protested and stood up valiantly, though single-handedly, for his rights. It was useless. For 10 days his doors remained locked, his business was at a standstill and in the eyes of the many who did not understand, he was a disgraced man.

By chance, the matter came to the attention of Thomas J. Hay, president of the Chicago Automobile Trade Association, of which the dealer was a member. A consultation with the association's counsel, a visit to the city hall, strong representations as to the dealer's character and standing, and in a few moments the matter was adjusted, his doors were unlocked and the stigma of suspicion was removed from him. What his individual efforts had failed to accomplish in 10 days, the strength of a united organization, of which he was a part, and to which he might have appealed in the first place, had accomplished for him in an instant.

Can You Afford to Be Without— Alignment Jigs?

THERE is no way to tell just how many cylinder blocks or crankshaft bearings have been spoiled by assembling engines in which the connecting rods were bent or twisted, or in which the crankshaft was sprung. It is sufficient to say here that that number runs into a good many thousands.

Many a car comes into your maintenance division with an engine in which the bores of the cylinder are badly scored or in which the bearings are pounding badly because the pins are worn oval or the crankshaft is out of line. Perhaps your shop is equipped to check such errors and you take steps in the rebuilding of the engine to see that when the rods and pistons go back in they run dead true in the bores. You may line ream the bearings, you may test the shaft with a dial indicator for roundness. Probably you have an alignment jig which tells you exactly if the piston pin and crankpin are parallel. Then when your shop assembles an engine you are pretty certain you can stand behind the job. New parts have been fitted and you feel these have been fitted as nearly perfect as human ingenuity can do so.

But, now, suppose you have no jigs or dial indicators. A customer's engine needs new pistons and rods, let us say. If you simply put these in place without checking them for accuracy, the chances are the customer will come in shortly and complain about his engine knocking and misbehaving generally. The result is that you may have to tear the job down again and do the work over, just because the parts were not checked originally.

How about when you install a new crankshaft? Maybe it is true and maybe it is not. It does not take very much abuse in shipping a crankshaft from a factory to spring it. Drop a Ford crankshaft on a floor and test it with a dial indicator. You may find it several thousands of an inch out. You may have an elegant stock of shafts on your shelves, but maybe only one of ten is dead true. You can only tell by checking them.

In this day and age when dealers are taking steps to

In this day and age when dealers are taking steps to make maintenance pay we cannot see how any degree of success can be attained without making sure that new parts, like pistons, rods and shafts, line up correctly when an engine is assembled. It will cut down "comebacks." Go out into your shop and find out how your men do this class of work. See if you can afford to be without alignment jigs and gages.

April Keeping Up With March

Last Month's Volume of Business Best In Two Years

Orders In Sight Indicate Activity Through June — Decline Likely After That

NEW YORK, April 11—The automotive industry enters the second quarter under decidedly encouraging auspices. Orders on hand, factory schedules established and orders given for supplies, make it certain that April will be as good as March, if not better. Parts makers already have received commitments which indicate that there will be no slackening in May. Prospects for June are good.

If sales continue at the present rate for another three months it would be surprising if there were not a midsummer decline in business. Such a seasonal falling off has been perennial in the industry except for the last two years. There was none in 1921 and in 1920 it came in the second quarter.

Manufacturers and dealers are just beginning to realize how big a month March was. To find a parallel it is necessary to get back to March, 1920, which was one of the three or four best months the industry ever had. All carload shipment records since that time were broken last month. They were materially larger than in any month of 1921 when the highest total was in August with 20,350. Last month's total was approximately 25,000. The biggest month in 1920, after March with 29,326 was August, with 23,386.

March production by Ford was more than 70,000 and it is expected to reach 100,000 this month. The other large makers showed a greater gain over February than did Ford.

One of the most encouraging incidents for the week in the whole industrial field was the reopening of the Ford assembly plant at Atlanta after being idle for a year. This step was justified by a 100 per cent increase over February in sales in the southern states.

A conservative estimate of the volume of sales for the industry as a whole in 1922 would be something like the following:

Passenger cars: At least equal to 1921 and probably considerably in excess.

Light trucks: An increase of at least 200 per cent over 1921.

Heavy trucks: An increase of at least 100 per cent.

Tractors: An increase of at least 200 per cent.

Parts and accessories: An increase of at least 100 per cent and probably much more.

Tires: A considerable increase.

N. A. D. A. STAFF ENLARGED

St. Louis, April 8—Announcement has been made by General Manager Vane of the National Automobile Dealers' Association of the appointment of Lynn M. Shaw as an assistant general manager of the dealers' organization. Shaw will take up his duties April 17. Shaw at present is secretary of the Indiana Automotive Trade Assn., a post he has held for two years. This organization was formed by the National Association two years ago and under Shaw's direction has grown into one of the strongest and most active in the industry.

Vane also announces the appointment of J. S. Casey as assistant sccretary of the organization in charge of N A. D. A. information bureau. Casey, a former sales manager for a household appliance concern, will also assist in the "One of a Thousand Campaign."

MERGER REPORTS DENIED

New York, April 10—The sensational raise of the past few days in automotive stocks have brought numerous rumors in the financial district of impending consolidation. One of these was a revival of the old report that Mack Trucks, Inc., and the White Motor Co. would combine. Another was that the management of the Pierce-Arrow Motor Car Co. would be taken over by C. W. Nash to a merger with the Nash Motors Co. Both these reports were emphatically denied.

AUTOMOBILE FREIGHT REDUCED

San Francisco, Cal., April 10—Substantial reductions in transcontinental freight rates are announced by all the cross-continent lines having terminals here and in Oakland, on a number of articles, chief among which is automobiles. Reductions range from 10 to 30 per cent on automobiles from Chicago to the coast, the 30 per cent reduction being in force on cars sent here for transshipment to steamers for export.

SEIBERLING FINANCING COMPLETED

Akron, O., April 10—Frank A. Seiberling, president of the Seiberling Rubber Co., announces that W. C. Durant heads a syndicate of 15 men each of whom have subscribed for \$50,000 of Seiberling stock on a basis of 40 per cent preferred and 60 per cent common. This completes the Seiberling financing.

WILLS BUILDING 50 CARS A DAY

Detroit, April 10—C. H. Wills & Co. will build about 50 Wills-Ste. Claire cars daily in April which will be practically the plant capacity. This is an increase of about 75 per cent over March. Orders on hand assure heavy production up to

Willys-Overland Report Shows \$23,560,389 Deficit

Net Loss of \$8,633,279 As Compared With Earnings of \$8,-822,152 In 1921

NEW YORK, April 8—The Willys-Overland Co. is another of these in the automotive field which has taken its losses and is now in a position to go ahead on a profit making basis. Its business, which has been excellent for several months, still is moving forward.

A detailed report for the year 1921 shows a deficit of \$23,560,389 after inventory adjustment, interest, depreciation and other charges. Its net loss after all expenses was \$8,633,279, as compared with earnings of \$8,822,152 in 1920. To this loss has been added \$1,742,653 for interest; \$2,130,169 for depreciation, etc.; \$733,922 for tool replacement and \$10,320,364 for other adjustments. This compares with a total deficit of \$5,480,394 for 1920

It is explained that in computing the net loss all expenses including reduction in price of cars, idle plant expenses, adjustment of inventory values and other extraordinary expenses have been included. It also is explained that the other adjustments mentioned include \$7,412,275 for reduction in value, investments in affiliated companies, \$759,468 for additional losses on commitments and \$2,148,621 for reduction in value of tools, dies, jigs and patterns.

National Receivership Suit Withdrawn; Firm Refinanced

Indianapolis, April 10-Coincident with the announcement today of the withdrawal of the receivership suit recently brought against the National Motor Car & Vehicle Corp., of this city, officers of the National, George M. Dickson, president, and M. E. Elstun, secretary-treasurer, announced the successful completion of the refinancing plan started some time ago by which the corporation receives more than \$450,000 of new working capital. This, together with the balance of the \$750,000 bond issue authorized by the stockholders, which has not yet been used in its entirety, places the concern in a strong position, according to the

AUTOMOBILE DAY AT FREEPORT

Freeport, III., April 10—Automobile day, April 8, was the first event under auspices of the newly organized Freeport Automotive Trades Assn., and was an intensive one-day campaign to launch the spring sales.

Used Car Situation Clearing Up

Minister's Sermon Creates Widespread Sales Interest

Dealer's Demonstration of Hill Climbing Made a Believer of Him and He Told About It

BRIDGEPORT, CONN., April 10-Telling the story of the hill-climbing feat of an automobile, as demonstrated to him by the dealer, in order to emphasize his sermon on "Believing," a Baptist minister at Mystic, near here, got a greater reaction from his congregation than resulted from any of his sermons in five years and incidentally started a stream of prospective customers toward the dealer's door. The dealer, having been absent from church that Sunday morning, just as on all the Sunday mornings before that, didn't realize for a time the cause of the sudden interest in the car he was handling.

The minister owned a little car which often failed to take the hill between his home and the church on high. Whenever this happened, he would take the car to the dealer, who also conducted a maintenance shop, and have it worked on. One day the dealer said: "Why don't you buy one of these new

cars. It will start at the bottom of that hill in high and go over the top at 40

miles an hour."

The preacher plainly said he didn't believe it. The dealer would prove it, and he did. The following Sunday morning the minister used the demonstration as an instance of how he was made to believe, his text being: "We disbelieve; we are made to believe, and we believe.' Early Monday morning one of his parishioners visited the parsonage to ask the name of the dealer and the make of the car. At prayer meeting Wednesday night, five or six more asked the same questions and Friday four more wanted to know. The preacher said it was the first time in five years that members of his congregation had come to him for fuller explanation of one of his ser-

A. A. A. Secretary Resigns: Objects to New Policy

Washington, April 8-Resigning as Secretary of the American Automobile Association, and as editor of the "American Motorist," as a protest against the new methods of obtaining membership in the Washington district, the action of William Ullman has provoked wide-spread discussion in the automobile trade, especially among car dealers and owners.

According to the statement issued by Ullman, his resignation was due to the employment of professional membership

promoters by the A. A. A. under a contract signed by George C. Diehl, National President. Ullman said that the management of the local district division was removed from control of the advisory board and placed in the hands of professional promoters and the annual dues increased from \$5 to \$10.

Studebaker Makes New Sales Record: 13.000 Cars in March

New York, April 8-Sales by the Studebaker Corp., approximating 22,000 cars, for the first quarter of 1922 exceeded sales for the same period of last year by approximately 100 per cent. March sales of 13,000 cars established a new record. The figures were disclosed by President A. R. Erskine upon his arrival here to attend the annual meeting of the corporation.

Retail sales figures for March in the following cities were given out by Erskine: New York, 1282; Newark and vicinity, 678; Chicago, 538; Detroit, 306; Los Angeles, 261; Cleveland, 184; Milwaukee, 145, and South Bend 106.

Saxon to Move Plant: Asks Creditors for More Time

Detroit, April 8-The Saxon Motor Car Corp. has decided to remove its plant to Ypsilanti, where it has leased quarters in an automobile manufacturing factory already established. The company owns no real estate in Detroit and has rented the property it occupies here.

The Saxon company has requested its creditors to grant an extension of time on their claims. It believes that if this relief is granted, it will be able to extricate itself from its present difficulties. The plan proposed will not be put into operation unless 80 per cent of the creditors consent.

LINCOLN-FORD CO. INCORPORATES

Detroit, April 8-The Lincoln-Ford Motor Car Co. has been incorporated in Michigan as a successor to the Lincoln Motor Co. It is capitalized at \$15,000,-000, all in common stock of which \$250,-000 has been subscribed and paid for in cash. All but three of the 2500 shares of stock already issued are held by Edsel B. Ford. The other stockholders are Henry Ford, Henry M. Leland and Wilfred C. Leland, each of whom holds one

BULL DOG TRACTOR CO. FAILS

Fond du Lac, Wis., April 10-An involuntary petition in bankruptcy has been filed by the Bull Dog Tractor Co. of Fnd du Lac, Wis., manufacturer of Bull Dog tractors. The concern originally was formed at Oshkosh, Wis., but moved its offices and factory to Fond du Lac about 18 months ago.

Dealers Solving Problem. Manufacturers Are Told

Reports Received at Meeting of N.A.C.C. Indicate Fair **Business All Year**

NEW YORK, April 8-Directors of the National Automobile Chamber of Commerce, already highly gratified at the business done by the industry since Jan. 1, received additional encouraging reports at their monthly meeting here this week. These reports were contained in telegrams from distributors in all section of the country which stated that business ranged from, "good' to "excellent" everywhere except in the Dakotas where there has been heavy snow.

The manufacturers were told that the used car situation is clearing up rapidly because there is a good demand at the low prices which have been fixed. The decline of prices in this market has been comparable to the reduction in the cost of new cars. The agitation on the subject of used cars has resulted in dealers using greater care in trading, making it possible for them to sell at a profit.

Credit Conditions Easy

Credit conditions are easy everywhere. There appears to be plenty of money for all legitimate enterprises. It was reported that one New York bank believes the present automobile sales season will be the best for two or three years and that many dealers in New York took up on April 1 loans which were not due until June 1

While the manufacturers naturally are greatly pleased with the upturn in business, they are not unaware of the fact that the industry now is in the midst of its spring trade and that sales cannot be expected to continue on the present basis after June 1. It is felt, however, that with the present bullish stock market, with general business conditions much better, with exports improving and with foreign exchange rising, business for the last half of the year should be

The Essex Motor Car Co. was elected to membership in the chamber. It will be represented by Roy D. Chapin.

Alfred H. Swayne and George M. Graham were delegated as counsellors to attend the annual meeting of the Chamber of Commerce of the United States at Washington in May.

J. Walter Drake and General Manager Reeves will represent the N.A.C.C. at a conference called by Secretary Hoover on April 12 to discuss trade association activities. The next meeting of the directors will be held in Detroit, May 3.

Denver Dealer Uses Radio to Tell Car's Merits at Show

Many Persons in Homes Also Hear His Broadcasted Sales Talk for Nash

DENVER, COLO., April 8—One of the most attention-winning features of Denver's highly successful automotive show was a radio telephone outfit used in connection with the exhibit of the Southwest Nash Motor Co., Nash distributor for Colorado, Wyoming and part of New Mexico.

Through arrangements with the Reynolds Radio Co., lectures on the merits of the Nash car were given at the Reynolds main station, and these were picked up by the instrument at the show, where the amplifier made them easy to hear by a good-sized crowd surrounding the Nash two-car exhibit booth. In this way. Manager D. W. James of the local distributing firm declares, show visitors took a far keener interest in the lectures than they would give to any selling talk by himself or any of his salesmen at the booth or in his salesroom. In addition to the lectures, musical entertainments were given frequently through the instrument.

Besides the show visitors, a large number of radio "fans" in Colorado and adjacent states were able to hear the Nash lectures and concerts, as they could be easily picked up by instruments within a radius of 500 miles.

Several show visitors told the Nash people that they had listened to the music and lectures in their own homes, and Manager James says that this unique method of advertising helped his organization to obtain an extra large list of prospective car buyers.

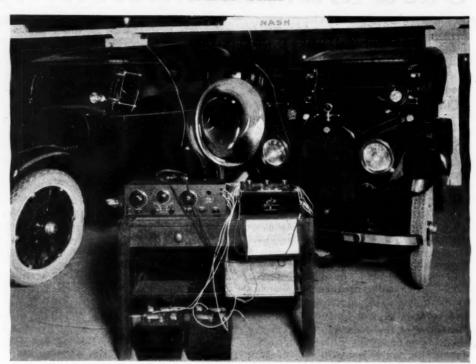
Bill for Longer Rural Motor Mail Routes Delayed in House

Washington, April 10—Objection of Congresman McClintic of Oklahoma, to House bill 8927 delayed the proposed establishment of rural motor routes or postal carriers from 36 to 75 miles in length. The House committee on Post Office and post roads had reported a bill which would establish a number of these long routes known as motor routes in states where there are no macadam roads, especially in territories where routes were too long for a carrier to make in one day.

Under the present law the routes of horse-drawn vehicles are limited to 36 miles and motor-drawn vehicles to 56 miles. The Post Office Department recommended the establishment of motor routes in order to expedite the delivery of mail.

Congressman McClintic insisted that practically every motor route in Oklahoma has proven unsatisfactory.

Radiophone Used by Denver Dealer to Give Sales Talk



PRICES HELP TRACTOR SALES

Chicago, April 8—The current issue of the Journal, published by the National Association of Farm Equipment Manufacturers has the following to say concerning tractors and gas engines:

TRACTORS—The reduction in price of tractors is said to have stimulated their sale. Wisconsin, New York and other states where dairying is carried on extensively are absorbing a large proportion of the tractors sold. At least one manufacturer finds sales to "other than farmers" more active than those to farmers themselves. Production, except in a few instances, is not increasing.

GAS ENGINES—A few gas engine man-

GAS ENGINES—A few gas engine manufacturers report that some of the farmers are beginning to buy now and a slight increase over the number of shipments in January is noted.

GARAGES DOING BATTERY WORK

Bridgeport, Conn., April 8—In order to furnish a more complete service to their regular patrons, as well as to assure them the highest grade of efficiency in this line, a number of the representative garages in this city are installing small battery recharging and repair departments. Garages that have planned to install this branch are partitioning off a small space of the main garage floor, adjoining the mechanical and repair department.

NEW OFFICERS ELECTED

Monmouth, Ill., April 8—Used car problems were discussed at annual meeting of the Warren County Automobile Dealers' Association. Officers were elected as follows: President, C. G. Jenks, Monmouth; Vice-President, Earl Stice, Roseville; R. J. Kenna, Monmouth; Secretary, J. Irvin Porter, Monmouth; Treasurer, L. T. Hall, Monmouth.

Willys-Overland Puts On 1,200 New Workers in Month

Toledo, April 8—The Willys-Overland Co., has led all Toledo automotive plants in getting back into large scale production in March. The plant took on 1,200 employes during the month and now has a total of 7,525 at work.

Milburn and Chevrolet held their own while many of the accessory plants took on more employes and boosted output.

The Electric Auto-Lite division of the Willys Corporation increased its employes by 300 last week, and has about 2,000 at work now.

In a recent survey of 130 Toledo plants, it was found that 30 were at 100 per cent production, 69 were operating at 75 per cent or better. Many of these were in the automotive group. Malleable iron foundries have shown a big pick-up in production.

The Bock Bearing Co., Doehler Die Casting Co., Bunting Brass & Bronze Co., and many others are among those operating with two or three months' orders ahead and with increasing working forces.

CALIFORNIA BUICK DEALERS MEET

San Francisco, April 8—Buick dealers from all over northern California held their initial "get-together" convention and banquet in the Howard Automobile Company's auditorium here at the end of March. The immediate occasion for the meeting was the arrival in San Francisco of H. H. Bassett, president, and E. T. Strong, general sales manager, of the Buick Motor Co. More than 150 representatives of the Howard organization heard these two officials talk.

Most Detroit Firms Plan Greater April Production

Ford to Make Over 100,000 Cars— Most of Buying Said to Be in Large Cities

DETROIT, April 10—Production schedules as outlined in Detroit factories for April show a general increase over all recent months, the March figures of this year being exceeded about one-third in many plants. The new Jewett and the new Columbia will get into volume production for the first time.

One or two additional models in existing lines are scheduled to be brought out, Buick being ready to present a new sport phaeton accompanying its sport roadster first exhibited at the New York show, and Liberty having a new roadster which will follow the lines of its new touring and which will sell at the same price.

Jewett will turn out about 1200 phaetons, which with 1800 Paiges scheduled, will give that factory an April total of 3000. In March 250 Jewetts and 1750 Paiges were shipped. Columbia ...will build 500 of the new line in April and about 700 of the former models.

Ford will put over its first 100,000 month of 1922 in April, the March total for all plants, domestic and foreign, running about 70,000. There is a pressing demand for closed cars, the Ford company declares, orders on these being 30 days ahead of possible output.

Dodge will continue on a capacity basis of 550 cars daily, and is also far behind on closed cars. To speed up production, the company is reported to have discouraged the sale of closed cars for the next two months, to permit it to reach highest production on the open models.

Hudson-Essex with a total production in March of about 5000 will increase this in April to a point that will give the company the largest April in its history.

Maxwell will build 250 cars daily in April, increasing from the approximate 200 daily schedule in March. Chalmers, in the face of a price increase, reports a schedule materially higher for April than for recent months.

Studebaker will build 11,000 cars in April and has scheduled the balance of the summer on that basis. Production in March has been speeded up to a point which gave the company 440 a day going into April.

Hupp Motor Car Corp., with a production in March of slightly over 3000, has scheduled 4000 for April. The March total ran considerably higher than schedule and April is also expected to run higher

Liberty will build about 600 cars in April. March figures, after a late start, ran higher than 350.

Cadillac, at capacity since the early

part of the year, will continue its schedule of about 100 cars daily.

Lincoln has scheduled 750 cars for April, all that the factory in its present state of reorganization, can build. Orders already covering production to July 1 are on the books at the factory.

Rickenbacker, with an output of over 300 cars in March, has scheduled between 500 and 600 for April. The factory is now fully equipped to meet production requirements.

Most of the new business is in the big industrial centers, officials declare, with a good demand, however, from the smaller cities, and considerable buying in the rural districts. Cities in the middle-western belts which were thought to have reached a point where replacement business was for the most part the only business to be expected, are reported showing a surprising volume of first sales.

Association Helps Dealer to Reopen Closed Place

Chicago, April 8-An instance of the service which may be rendered to an automobile dealer by his trade association, is related by Thomas J. Hay, president of the Chicago Automobile Trade Assn. Recently, a dealer who was a member of the association, had his place of business closed by the Chicago police after an automobile which had been stolen was found there. The dealer had purchased the car in good faith and gave the name of the man from whom he bought it. The seller admitted the history of the car and said that the transaction so far as the dealer was concerned, was in perfect good faith. Nevertheless, the police refused to permit the dealer to open his salesroom.

After the place had been closed about 10 days, the dealer made his predicament known to Hay. The attorney for the association immediately took up the matter with the city authorities and convinced them of the innocence and high standing of the dealer. He then was permitted to resume business. If he had called this matter to the attention of the association sooner he would have saved a good deal of time. Hay said.

Firestone Tire Production Increased to 20,000 a Day

Akron, April 10—Announcement is made by the Firestone Tire & Rubber Co. that its production has been increased to 20,000 tires a day, compared with 17,000 two months ago. Increased business comes both from dealers and automobile manufacturers.

TO SELL RICKKENBACKER

Chicago, April 8—The Chicago Agency for the Rickenbacker automobile has been granted to the L. Markle Co., 2309 Michigan avenue, of which Lafayette Markle is president.

March Production Nearly Double That of Year Ago

Carload Shipments by Manufacturers for the Month Estimated as 25,000

New York, April 8—Carload shipments of automobiles and trucks by all makers in March are estimated at 25,000. Production for the month by members of the National Automobile Chamber of Commerce were 135 per cent of February and 190 per cent of March, 1921. The factory shipment figures for the first three months of 1920, 1921 and 1922 follow:

TODE TOTTOW.			
Ca	rleads		
	1920	1921	1922
Jan20	,057	6,485	15.241
Feb2!	5,505	9,986	19,600
March25	,236	16,287	25,000
Dri	veawa;	yn	
	1920	1921	1922
Jan29	0,283	3,185	7,397
Feb43	3,719	7,507	9,950
March5	7,273	9,939	15,800
	Boat		
	1920	1921	1922
Jan	*****	93	154
Feb	******	99	169
March	*****	75	264

EQUIPMENT BUSINESS BETTER

New York, April 10—Wholesale business in automotive equipment for the past three months of the year has been running 20 to 40 per cent ahead of last year in volume in different sections along the Atlantic seaboard. Jobbers from Maine to the District of Columbia, who attended the meeting of the Eastern Automotive Equipment Association unanimously reported steadily improving conditions.

371.798 CARS MADE IN MARCH

New York, April 10—In the first quarter of 1922, with March partly estimated, members of the National Automobile Chamber of Commerce produced 207,560 cars and trucks which was 220 per cent of the same period for 1921. All manufacturers reporting produced 371,798 cars and trucks in the first quarter which was 162 per cent of the same period for 1921.

PUTS RADIO IN SALESROOM

Chicago, April 11—Thomas J. Hay & Son, distributors of the Cleveland cars in Chicago, have installed a radio receiving outfit in their salesrooms at 2530 Michigan avenue, which is attracting many visitors to the store. News reports and concerts are received and amplified so that they may be heard throughout the room.

TO ORGANIZE SERVICE MANAGERS

Chicago, April 11—The Chicago Automobile Trade Association has approved a proposal to organize a service managers' association.

California Sales 70 Per Cent Ahead of a Year Ago

Tractor Business Alone Depressed,
Due Largely to Low Cost of
Horse Feed

Sales of passenger cars for northern California, for the first quarter of 1922 are at least 70 per cent better than they were one year ago, and more than 50 per cent better than they were two years ago. Sales of motor trucks to fleet owners, and the establishment of truck fleets in the smaller towns, show nearly 100 per cent gain over the first quarter of 1920, but sales of trucks to individual owners, for their own uses, have not kept pace with fleet sales, and are not more than 50 or 60 per cent better than in the same period of 1920.

These are the average of estimates of a dozen of the leading passenger car and truck dealers of San Francisco and Oakland, the two largest centers of distribution of these automotive vehicles in northern California, if not in the entire state. The dealers are not disposed to comment on tractor sales, and, as one dealer said, "the less said about the tractor business, the closer you'll come to the truth." Considerable reduction in the cost of feed for livestock, remaining high wages for skilled labor to operate tractors, and the relatively great depreciation in the value of usefulness of the tractor unless it is cared for and operated by a man trained to the job, have combined to put the horse back in many fields where the tractor wandered, under the unskilled guidance of the "hired man" in 1920 and 1921. Indications are that there will be still more horses than tractors pulling the plows and harrows in 1922 in northern California, and these indications are the forecasts of the tractor dealers themselves.

Automobile sales in California for February, 1922, were 254 per cent higher than they were for February, 1921. In February of this year, the dealers of California sold 8,159 cars, while in February, 1921, they disposed of only 3,213 cars. The 47 counties of northern California are credited with 3,298 car sales in February, 1922, as compared with 1,310 sales in the same month of 1921. The eleven counties of southern California show 4,861 cars sold in February, 1922, against 1,903 for February, 1921. Trucks to the number of 1,075 were sold in California during February, 1922.

During February, 1922, the registrations for the entire state were 9,234, as compared with 6,694 in January, 1922, a gain of 2,540. In Alameda county, in which is located the city of Oakland, and which holds a high record for automotive vehicle and equipment sales, 656 cars were sold in February, of this year,

compared with 463 in January, 1922, according to figures compiled by B. J. Rosenthal, editor of "The Radiator" and closely connected with the California Automobile Trade Assn.

Ford Five-Day Week to Be Extended to Lincoln Plant

Detroit, April 7—The Ford five-day week will ultimately include Lincoln Motor Co., but there is a matter of considerable organizing to meet production demands before it becomes effective. At present Lincoln is about 200 cars behind on orders and will not catch up, working full week and extra time in some departments, until well into the summer. A 700 schedule has been fixed for April.

Privileges of the Ford investment plan have now been extended to Lincoln employes, thereby effecting a new tie between the new and old enterprises. There is now \$10,000,000 invested by 18,000 Ford employes under the investment plan. Interest and special returns of \$1,250,000 have been paid to investors in the two years the plan has been in operation.

ASSOCIATION TO HAVE BUILDING

Philadelphia, April 8-President W. H. Metcalf, of the Automobile Accessories Business Assn., announced at a meeting of team captains conducting the big drive for a building fund for a home for the organization, that 230 prizes have been offered. The list is headed by four automobiles, a Paige touring car, a Nash roadster, a Columbia Six and a Ford touring car. A reception and prize drawing will be given in Lulu Temple on the night of May 12. Metcalf also said that several thousand dollars toward the fund already had been collected, but that it would be necessary to raise about \$25,000 within the next month. The lowest prize is worth \$1.50 and the highest \$1400.

SERVICE MANAGERS MEET

Cleveland, April 8—Chandler service managers, 200 of them, met here last week as guests of their company.

J. R. Hall and George F. Graham, vice presidents; W. H. Whitehouse, assistant service manager; R. C. Berren, of the engineering department, and C. M. Thompson assistant engineer, delivered addresses at the sessions which were held at the Chandler plant.

The value of maintenance as a medium for holding good will for the Chandler was emphasized. On trips through the factory, the service managers saw every operation of the production.

TIRE FACTORIES HAVE COAL

Akron, O., April 10—Practically all tire and rubber factories in Akron and vicinity have more than a 60-day supply of coal on hand and have other coal under contract for delivery during the next 30 days.

New Haven Dealers Adopt Used Car Appraisal Plan

Appraiser Appointed by Dealers
With Clearing House as
Market

NEW HAVEN, Conn., April 11—New Haven Automotive Assn. has adopted the expert appraiser-central clearing house plan in solution of the used-car problem. Frederick O'Connor of 386 Ferry street this city, has been appointed appraiser of used cars and a central clearing house has been established at 135 Union street.

Any owner of a used car who wishes to dispose of it in the purchase of a new one is required to take the former to O'Connor at his office, where, at a fee of \$2, the present value of the car is appraised. The car owner receives a slip from the appraiser, which he takes to the dealer. If the new car is bought, the \$2 fee is refunded. The object of the procedure is to both protect the dealer and to give the buyer a fair price for his used car.

PARTS MAKERS SEE BUSINESS

New York, April 8—The end of March brought no slackening in the business improvement reported in steadily increasing volume by parts manufacturers since Jan. 1. Practically all manufacturers have sufficient orders booked for April to insure a better month than March. Still more gratifying is the fact that many of them have received substantial commitments which will carry them through May.

Early in March there was considerable speculation among parts makers over the prospects after April, but developments in the past two or three weeks have made it certain that there will be no slackening in operations for another two months at least.

FORD IMPROVEMENTS MADE

Detroit, April 11—Interiors of Ford sedans and coupes are now being finished in walnut brown broadcloth and seats upholstered in same material with chalked ebony stripes. Heavy floor rugs have been added and lifts of improved design have made windows easier to raise. The new carbureter gives increased acceleration and greater flexibility. Other mechanical improvements include lighter and better balanced pistons and connecting rods, which have been described in Motor Age.

LIMITING TIRE PRODUCTION

Akron, O., April 10—Akron tire manufacturers have stopped expanding finished goods inventories, and are applying production direct to sales. Every company in the city has an inventory of about the right balance, with at least a 60-day supply of tires on hand.

Motor Theft Commission to Start Membership Campaign

Will Appeal to Trade for Financial Support to Carry Out Its Plans

CHICAGO, April 11—The Interstate Motor Theft Commission, organization of which, with headquarters here, was announced recently through newspapers and other publications, is launching a membership campaign in which it will appeal to automobile manufacturers and dealers, automobile clubs and individual owners for financial support.

The membership, according to W. R. Van Courtland, commissioner, will be divided into four classes: Organization, supporting, individual and associate. Automobile clubs and trade associations will be solicited for organization memberships, with fees ranging from \$10 upwards. Firms engaged in the automotive industry will be solicited for supporting memberships, the fees running from \$10 upward according to the amount of capitalization. Individual membership will be \$5 and associate membership \$3 annually. The last two named classes will be open to individual owners.

The commission proposes to reduce theft of automobiles through the establishment of a central clearing bureau in which card records of all automobiles sold and licensed in the United States would be kept. Daily reports of new registrations would be received from all states and the plan proposes that by comparison of cards any duplicate or false number given by an applicant for a license would be detected. This would be reported to the proper police officers and would lead to the recovery of the stolen car and probably the apprehension of the thief. The service to law officers would be free and in addition the commission would offer rewards for the recovery of cars stolen from its members. Many details of the plan have not yet been worked out, according to Commissioner Van Courtland.

Chicago Retail Sales Go Up; Low Priced Cars Lead

Chicago, April 7—A decided pick-up in the retail sales of automobiles in Chicago, is indicated by the time-payment sales for the week ending April 1, in which 1,003 chattel mortgages to secure deferred payments were filed for record. The time-payment sales for the preceding week are 672 and for the week before that, the number was 873, the highest for any week of this year up to that time.

C. L. Wolf, secretary of the Central Automobile Financing Assn., who compiled the figures, said that low or medium priced cars predominated in the sales for the week ending April 1 to a greater extent, probably, than in any previous week. He found truck sales fairly active and increasing.

Dealers also tell of increased sales of the lower priced cars and trucks. One dealer handling a car under \$1,000 and one selling around \$1,500, said his sales for March exceeding his total sales for the preceding three months combined. His sales were two to one in favor of the low priced car. A dealer who handles two cars in the higher priced field said his sales for March were slightly less than for the same month of last year. Another dealer in the high priced field reported sales of around 30 to 35 cars a month for the last few months, when his normal quota should have been about 45

ENTRIES IN RAISIN DAY CLASSIC

Fresno, Cal., April 10—Eleven entries have been made in the 150-mile Raisin Day Classic to be run on the speedway here on April 27, in which \$18,000 in prize money, and 675 points in the national championship are at stake. Ralph De Palma's signed contract was the last one to arrive, getting in at the end of March. Other entries include Bordino, De Paolo, Murphy, Sarles, Hearne, Miller, Klein, Thomas, Elliott and Hartz. Milton also probably will be in the contest.

McGRAW TIRE PROSPECTS

Cleveland, April 7—Directors of the McGraw Tire and Rubber Co., at a meeting here, decided not to do any new financing for the present. While the company lost money in February, it is breaking even in March, with the prospects much better for April.

GENERAL MOTORS INSURANCE PLAN

New York, April 8—The General Exchange Corp., a subsidiary of the General Motors Corp., has been organized to carry fire and theft, liability, property damage and collision insurance for owners of automobiles.

Fair Sales of Automobiles In Rural Illinois Reported

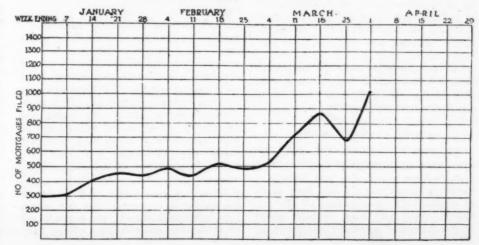
Farmers Buying Some Passenger Cars and a Few Tractors and Trucks

BLOOMINGTON, ILL., April 10—Trade in automobiles in central Illinois has opened very satisfactorily. A few tractors are moving, about one-half to farmers and the other half to highway commissioners for road improvement. A large number of sales of the latter were made after competitive demonstrations.

A few trucks are moving, perhaps as many as tractors. The bulk of the automotive business, however, is in passenger cars. The increase in the prices of farm products came in the nick of time to stimulate the business and the effect has been excellent. The miners' strike may affect cities which are the centers of the black diamond industry, but this section of the state is far enough out of the coal belt to escape the depression anticipated until the controversy with the miners is settled. Farmers have commenced to sow oats and will shortly plow for corn. They have embarked upon their spring work in a far different frame of mind than was the case a year ago, when the agricultural depression was at its peak. This spring, farm labor is cheaper and, in fact, everything that the farmer buys is lower, while his grain and live stock are much higher and promise to become stronger as the summer passes.

The thousand miles of concrete highway which the state of Illinois will construct this year, will sell many motor cars to farmers who have held out because of bad roads so many months of the year. With the concrete pavement, the motor car makes the highways passable for twelve months out the year and there will be no necessity for storage during the mud embargo.

How Approach of Spring Causes Chicago Retail Sales to Climb



CONCERNING MEN YOU KNOW

H. A. Grubb, formerly with Star Rubber Co., Akron, O., was appointed general sales manager of the Victor Rubber Co., succeeding C. A. Swineheart, resigned. Grubb takes charge at once. Swineheart has been sales head of the Victor company for many years.

A. D. Dumas, Syracuse, N. Y., has been engaged as new service manager for the Dodge agency in Toledo by H. W. Lancashire.

C. B. Cole has severed his connections with the Tool Sales & Engineering Co., and is Chicago manager for the Alvord Reamer & Tool Co., Millersburg, Pa., and the Standard Saw & Tool Mfg. Co., Inc., Boston, Mass.

Robert M. McCormick has been appointed salesmanager for Grieb & Thomas, distributors of Kissel Cars and Columbia Sixes, at Philadelphia.

A. H. Bobbrow has bought the interest of Justin P. McDuff in the Franklin Auto Supply, which they had run jointly in Greenfield, Mass.

A. C. Sauers, agent for the Federal truck, has bought from A. E. & L. O. Peck their large garage in Westfield, Mass.

F. L. Ryan has been appointed Pacific Coast manager of the India Tire & Rubber Co., with headquarters in San Francisco. O. J. Smith has been appointed India Tire distributor for San Francisco.

L. D. Whitehurst has been appointed manager of Cole Motors, Inc., at San Francisco. C. N. Trivette and J. H. Nedderman, both of this city, have been added to the sales staff.

Norman de Vaux, president of the Chevrolet Motor Co. of California since 1915, has resigned to devote all his time to private business interests. On January 1, 1920, de Vaux sold his interests to General Motors, and has been on salary here

Edward B. Jacobson, who recently resigned from the Jacobson & Brandow Co., Pittsheld, Mass., has organized the Rico Company for the Manufacture of an ignition system for automobiles and development of small patents. Charles A. Mattison, who was for 18 years with the Pittsheld Spark Coil Co., is associated with

Noyes E. Alling, president of the Alling Rub-ber Co., whose chain of stores handle a wide variety of tires and automotive accessories, has been named a member of the Bridgeport Finan-cial Advisory Board by Mayor Fred Atwater.

F. E. Doolittle, formerly superintendent of the Knox Motors Co., has become a member of the Dunbar-Hoag Co., Oakland distributors in Springfield, Mass., and will supervise maintenance.

C. E. Dawson, formerly salesmanager of the Chevrolet Motor Co., of Michigan, has been appointed assistant to general sales manager Colin Campbell, of Chevrolet Motor Co.; M. D. Douglas, formerly assistant salesmanager at Flint, has been appointed to succeed Dawson in charge of factory sales activities.

V. H. Day, general salesmanager of the General Motors Truck Co., supervised the opening of a new direct factory branch in Dallas, Tex., recently, which will be under the direction of H. A. Neill, formerly manager of the Philadelphia branch and recently connected with the factory sales department. Howard Parks, who has been selling G. M. C. trucks in Texas, will be associated with Neill. Pierre Schon, direct factory wholesale representative in the southwestern territory. will continue in that position. ritory, will continue in that position.

Roger N. Lagow has been appointed a factory representative of Hupp Motor Car Corp. in South and Central America. Lagow has been a professor of languages and has had a diversified business experience. With the addition of Lagow and Charles S. Turner, who will travel the Orient, Hupp is now represented in every foreign country except Russia and some of the Balkan States. It has approximately one hundred foreign distributors and one thousand dealers.

W. H. Farrington has been elected president and general manager of the Maxwell-Chalmers Sales Co., the Chicago factory branch of the Maxwell-Chalmers Corp. He succeeds J. H. Willson, who goes to Dodge Bros. Co. to have charge of foreign sales. Willson formerly was in charge of foreign sales for the General Motors Corp. Farrington has been with the Maxwell-Chalmers Sales Co. for five years and has been in the automobile business in Chicago for 16 years.

Dealers to Lose Equity in Confiscated Automobiles production are equipped.

San Francisco, Cal., April 8-Automobile dealers in northern California, who happen to have equities in cars whose owners are convicted of transporting liquor, will lose that equity, since the confiscated automobile is to be sold for the credit of the Government, no other claim against the car being allowed. This ruling was promulgated here by John T. Williams, United States District Attorney, following instructions from Attorney-General Daugherty, in Washington. In other words, the Government will take the entire proceeds from the sale of any automobile confiscated by prohibition enforcement agents, just as it has taken the entire proceeds from the sale of any automobile seized by agents working under the Harrison Narcotics Law.

The purchaser of such an automobile from the Government will receive a clear title to the car, and no prior claim of any kind shall stand against it.

STUTZ FACTORY BUSY

Indianapolis, April 8-For the first time since its completion, a little more than two years ago, the new factory of the Stutz Motor Car Co. has been given an opportunity to demonstrate its capacity. This has been brought about by the increased activities necessary for

the production of the new Stutz D-H engine with which all Stutz cars now in

The new factory has more than 400,-000 square feet of floor space and a maximum capacity of 25 cars a day under present arrangements, employing from 1200 to 1500 men and women when in full operation.

The company reports that its dealer organization is being enlarged and that prospects for the season's business are

ELECTRICS SHOWN IN NEW YORK

New York, April 10-New York has just held its annual Electric Automobile Show on the exhibition floor of the New York Edison Company, Irving Place and Fifteenth street. Six makes of trucks, three makes of passenger cars and a number of parts, accessories and equipment were tastefully displayed. Two new electric models, the Electrocar taxicab and the C-T Bantam 1/2-ton truck were shown for the first time and contrasting strongly with these latest creations of electric vehicle engineering, was an electric that ran on the streets of New York over 40 years ago. The cars shown were Electrocar, R & L and Detroit. Trucks were Walter, O. B., Ward, Walker, Steinmetz, and Lansden. The Steinmetz is also a newcomer as far as the public is concerned, the car having been previously shown over a month ago to newspaper and magazine editors only.

Chalmers Note Holders Act to Protect Their Interests

Form Committee When \$94,000 Interest Payment is Defaulted-**Maxwell Not Affected**

NEW YORK, April 8—A committee to protect the interests of note holders of the Chalmers Motor Co. has been formed here as the result of the default by the company in the payment of \$94,-000 interest due April 1 on \$3,150,000 first mortgage, 6 per cent gold notes. The committee is headed by M. N. Buckner, chairman of the board of the New York Trust Co., with Alfred A. Cook, as counsel. The other members are Philemon Dickinson of C. D. Barney & Co., and Martin F. Stern of J. S. Bache & Co.

It is stated by the committee that in its judgment, "it is imperative that prompt and concerted action be taken by the note holders for their protection and that the notes should be deposited immediately." In order to participate in the benefits of the protective agreement, holders of notes must deposit them on or before April 20, with the New York Trust Co.

Walter P. Chrysler, chairman of the board of the Maxwell Motor Corp., said that he had no statement to make at this time in reference to the default on the Chalmers' notes. It is asserted, however, that it has no direct bearing on the Maxwell finances, as the latter company simply occupies the position of stockholder and creditor towards the Chalmers company, having no liability for Chalmers notes or accounts.

Officers of the Maxwell corporation assert that its financial position is extremely strong. This is reflected in its ratio of quick assets to demand liabilities which are between six and seven to one. It is expected that capacity production will be approached in the next few months.

SANDOW CO. TO LIQUIDATE

Chicago, April 11-Under an agreement with the creditors of the Sandow Motor Truck Co., a trustee has been appointed to liquidate the company, which was organized to manufacture trucks. The trustee, Edwin D. Buell, said the total liabilities, including bank loans of \$164,000, were about \$207,000. He said the bank creditors had agreed to wait until the general creditors had been paid 50 cents on the dollar before participating in the proceeds of the general assets. The property of the company, including machinery and good will, will be sold at auction April 14.

ILLINOIS ASSN. DIRECTORS MEET

Peoria, Ill., April 11-A meeting of the board of directors of the Illinois Automotive Trade Assn. will be held at Danville, Friday, April 21.

Two 150-Mile Races In California This Spring

San Carlos and Santa Rosa to Witness Big Western Classics

SAN FRANCISCO, April 11—Northern California will have two big automobile racing events this spring, the first at San Carlos, in the "Golden Gate Derby" on April 16, and the second at the Cotati Bowl, near Santa Rosa, on May 7.

Later in the year, on July 4, 5 and 6, the annual Nevada road race, over 900 miles of the roughest roads to be found anywhere in the west, will be run. This race has taken the place of the old Los Angeles-Phoenix road race, and was won last year by "Bill" Bramlette, veteran of the California-Arizona Marathon, driving a Lincoln. "Bill" will be among those present again this year, as will also the Nikrent brothers, who did their stuff toward making racing history in the old days of the Los Angeles-Phoenix contest. The Nevada race attracts more attention among automobile owners who do not see the race than any other, for it provides a much harder and more decisive test of the cars entered than do the bowl races, even though the latter might be for as great distances.

The race in the San Carlos Bowl on Easter Sunday will be for 150 miles, under auspices of the San Francisco Speedway Assn., of which Frew Morton is president. The outcome of several 250-mile races in the different bowls on the coast recently has led to the conclusion that the result of these races is decided in the first 150 miles, so the shorter distance has been named for the April contest. Among the entries are Ralph Mulford, driving an eight-in-a-row Duesenberg; Jimmy Murphy, with the mate to Mulford's car; Tommy Milton, Ralph De Palma, Roscoe Sarles and probably Dario de Resta.

The Cotati Bowl race, on May 7, also will be of 150 miles, according to J. Francis O'Connor, president of the North Bay Counties Fair Assn., and of the Cotati Speedway, who made a trip to New York to sign up drivers for the event. Virtually all the men entered in the San Carlos race of April 16, also are entered in the Cotati contest, with the addition of Pietro Bordino, who has sent in his entry to drive his "three-bottle" Fiat.

STEEL PRODUCTION INCREASES

Cleveland, April 8—The steel industry in Cleveland has shown a gradual increase in production since the first of the year, and the automobile industry largely is responsible, according to reports made to the Chamber of Commerce.

The production of the steel mills in this city is slightly below the estimated 65 to 70 per cent of normal which pre-

vails elsewhere, but the production late in March was greater than it has been at any time within the last year.

Orders on the books and inquiries coming in indicate that the industry will maintain its present rate through the summer and possibly show even a better record.

There are 11 blast furnaces in this city and four are in operation.

Better Foreign Business For Hudson and Cadillac

Detroit, April 11—Hudson export business is showing very satisfactory activity, President Roy Chapin said this week. The company has increased to some extent its representation in foreign fields and retained all its force through the period of depression.

Cadillac Motor Car Co. reports a large increase in shipments of parts to foreign territory over last year. In Buenos Aires the increase was 213 per cent; Christiania, Norway, 37 per cent; Geneva, Switzerland, 135 per cent; Havana, 315 per cent; London, 138 per cent; Sydney, 420 per cent, and Utrecht, Holland, 651 per cent.

TRUCK SALES INCREASING

Springfield, O., April 8—Orders from France and Australia are being filled at the Springfield works of The International Harvester Co., according to announcement of Superintendent Charles H. Smart. The motor truck business is brisk at this plant. Good sized orders have been received from foreign countries and various points in the United States recently. The Springeld works is continuing its production schedule of 50 motor trucks daily. The force has been increased within the last week.

Motor truck business for March at the plant of the Kelly-Springfield Motor Truck Co. was the largest of any month during the past two years, General Manager E. O. McDonnell says. A gradual improvement in business conditions is noted in reports received by the company from various parts of the United States.

DALLAS AUTOMOBILE PARADE

Dallas, Tex., April 8—Dallas will stage a great automobile style parade during the week beginning May 25, it is announced by the Automobile Assn.

The parade will consist of cars driven by women. The only requirement will be that the car they drive is owned by the family. The parade course will lie over a route of some 10 miles covering the business district and the prizes will be awarded on basis of ability of the drivers to handle the machine, and costumes worn. Already the plans are under way. It is said more than 500 cars will be in the parade from Dallas and that probably 200 will be entered from surrounding towns.

Flint Companies See Signs of Business Improvement

Buick Production for March Double That of Same Month Last Year

F LINT, MICH., April 8—Proof that the automobile industry is in a much healthier state than it was this time last year, and that its chances for improvement are good is evident in the statements of motor car company heads and the heads of allied plants.

"Our business for February, 1922, was 242 per cent greater than that of February last year," said H. H. Bassett, president and general manager of the Buick Motor Car Co. "March production will be double that of last March, and there is every indication that our business will be better than the calendar year of 1921."

Chevrolet Motor Car Co. has a schedule of close to 10,000 cars for April delivery, and last week started a night shift for the first time in several months. Nine hundred axles are now being turned out a day and a production of 800 engines a day is expected to be reached by the first of April, according to C. F. Barth, general manager.

"Total shipments for Chevrolet during the month of February, which was a short month, were in excess of 10,000 cars," said M. E. Coyle, Chevrolet's comptroller.

The Dort Motor Car Co., through its local agency, made this statement with reference to production. For the month of January, figures show an increase in production of 336 per cent as compared with January, 1921; February figures for this year show an increase of 150 per cent over January, while it is expected that March order deliveries will further boost the production to 229 per cent above those for February.

Announcement has been made that the plant of the Flint Motor Axle Co. will soon be running on full time.

According to a statement made before a Chamber of Commerce group by John Edgerly, general manager, business for the Flint Varnish and Color Works, 95 per cent of whose output goes to motor car manufacturers, has improved 75 per cent. Walter Heginbottom, of the Marvel Carbureter Co., reported good business conditions in the sales field for his company.

The Stewart Body Co. this week requested all of its mill employes to report for work.

BODY PLANT BUSY

Salem, O., April 10—The plant of the Mullins Body Co. is operating at 70 per cent of capacity and the output will be increased as rapidly as additional workmen can be employed.

BUSINESS NOTES

American Felt Cutting Co., announces that it will open its new shop in Detroit, April 15, the principal offices of this concern are in Chicago, Boston and New York.

Monitor Motor Co., Columbus, O., has had suit for collection placed against it by the receiver for the Herschell-Spillman Co., North Tonawanda, N. Y.

Victor Rubber Co., Springfield, O., announces that it has had a good month in March and that the prospects for April are very encouraging.

Alameda County Automobile Trade Association, a branch of the California Automobile Trade Association, announces a reduction of ten per cent in the pay of garage mechanics by all members of the county association, effective April 1. Repair charges to the motorist have been reduced correspondingly. pair charges to correspondingly.

Pyrene Mfg. Co., Inc., has moved into its new factory at Newark, N. J. The building is of thoroughly modern fireproof construction. The general offices formerly located in New York and all manufacturing departments will now be under one roof. To improve, if possible, the service rendered customers, the company has installed a department for the sale of a complete line of safety devices as well as the long line of fire fighting appliances.

American Bosch Magneto Corp. is employing twice as many workers as it did this time a year ago and is operating at about 50 per cent of

Universal Shock Absorber Co., Cleveland, O., has been incorporated with a capital of \$30,000 to manufacture and sell a new style of shock absorber. Incorporators are M. Newhouse, H. C. Slagle, D. L. Coy, F. G. Morris and Thomas

Goodyear Tire & Rubber Co., Columbus, O., has taken a long-time lease on a large five-story building, where the Columbus branch will be located as soon as the necessary repairs and changes are made. It is expected that the new branch will be occupied some time in April.

Hersch Parts Co., Cleveland, are in their new building.

Pointer Signal Corp., Rock Island, Ill., with a capital stock of \$25,000, has been incorporated to manufacture automobile safety signals.

Willis Tire & Rubber Co., is the name of the combination of that company with the Weil-Wheaton Rubber Co., capital \$100,000.

James Ballantyne Sons, Bridgeport, Conn., have opened up a new accessories store to carry a complete line of automobile parts and supplies. James Ballantyne has been representative in this section of the State Motor Vehicle Department in examination of applicants for motor vehicle oper-

Godfrey, Duffley, Rolfe Co., wholesale dealers in automobile accessories and garage equipment, are installed in their new store in Springfield, Mass. T. G. Duffley is store manager.

Avenue Motor Co., Cleveland, has leased space for a new building in which it will handle the Maxwell and Chalmers.

Stratford Specialty Co., Stratford, Conn., dealers in garage supplies and automobile accessories, has been incorporated for \$15,000 to conduct and develop its business. Plans are already practically completed for erection in the fall of a modern business block.

Star Motor Co., of California, which is to market the new Star automobile, in this part of the west, has completed organization, according to announcement by R. C. Durant, president of the Durant Motor Co., of California, who is organizing the new corporation. The car will be built at the new Oakland plant of the Durant

Kirkland-Cravens Motors, Inc., is the subject of bankruptcy petition filed in Kansas City by a number of creditors. This company had been sold in March to the Missouri Valley Auto Co., and it is alleged that in the transaction was \$17,000 of the stock of the purchaser, which was turned over to Walter Cravens in part payment of a prior debt of the Kirkland-Cravens company to Cravens.

New York Spring Sales Far Ahead of Last Year

New York, April 8-Passenger car sales in the New York territory are following a normal curve for early spring, with the March sales records running with some cars almost twice what they were in February and with all makes substantially ahead of last month. The indications are plain that the metropolitan trade will have at least a good spring business, and there are some pointers to a larger volume than dealers anticipated when the year opened.

Fifteen makes of cars are running far ahead of all others in their price classes and 15 others are making what might be termed good sales records. Sales in the remaining classes are low.

In the high priced class, Cadillac, Packard, Franklin, Peerless and Marmon have led since the first of the year. In the low and medium priced class Ford is followed by Buick, Dodge, Studebaker, and Chevrolet.

In the aggregate sales in the metropolitan area for the first three months of the year will run between two and three times the total for the same period of 1921.

NEW CANADIAN COMPANY

St. Thomas, Ont., April 8-Wood-Gorrie Motors, Limited, is proceeding on preliminary work in connection with the assembling of light six-cylinder motor

cars in St. Thomas, Ont. Temporary quarters have been secured for the first season's work. The company proposes to purchase about 25 acres in the eastern industrial section of St. Thomas for the site of a permanent plant.

W. B. Wood of Toronto, president of the company, says that if the enterprise proves successful it will expand, but that at the outset it was not necessary to have a large capitalization. A. J. Gorrie of Montreal, formerly general superintendent of Canadian Northern lines in Quebec, is vice president.

BODY FACTORY IS BUSY

Philadelphia, April 8-Automobile manufacturing is now so active that the Edward G. Budd Manufacturing Co., makers of all-steel bodies, has enough unfilled orders to keep its plant operating at capacity for several months. The ratio of high, medium and low-priced bodies being sold is normal. Prices have been reduced about 40 per cent, on the average, which has contributed to cuts in the prices of completed cars.

DE PALMA TO DRIVE DUESENBERG

In Motor Age of March 30 it was stated that Ralph De Palma was building, under the patronage of Cliff Durant, "a new racing creation" to be used in the Indianapolis race. The Duesenberg Automobile & Motors Co., Inc., states that De Palma is to drive a Duesenberg "Straight-Eight" at Indianapolis.

Ford's Atlanta Plant to Reopen; Idle for a Year

Production of 76 Cars a Day Planned-100 Per Cent Increase in Business Reported

A TLANTA, GA., April 8—Two train-loads of materials are on the way to Atlanta for the assembling of the first Ford cars to be built in the south in more than a year, according to W. W. Mitchell, manager of the Atlanta branch of the Ford Motor Co. The branch on Ponce de Leon avenue will be opened April 13, with a production of 76 cars a day. There will then be seven or eight carloads of materials arriving daily, according to Mitchell, and 15 to 20 carloads of assembled automobiles moving

Between 300 and 350 men will be employed at the plant, it is stated, being paid the Ford minimum scale. Preference will be given to former service

According to Mitchell, the business of the Ford Motor Company in the south has increased more than 100 per cent, in the last 30 days, many Ford dealers having a waiting list .

STOCK SALES ORDERED STOPPED

Akron, O., April 8-Further stock sales by seven Ohio rubber companies with an aggregate capital of \$12,979,925, have been ordered stopped at once by Arthur L. Stewart, Ohio state securities commissioner. Stewart's action in withdrawing permission for further stock sales, in addition to these rubber companies, affects 23 miscellaneous companies with a total par value for the 30 companies' stock of \$17,917,555.

The seven rubber companies are: The D. & M. Cord Tire Co.; Phoenix Rubber Co., of Akron; Glamorgan Tire & Rubber Co., of Orville; Avalon Rubber & Mfg. Co., of Akron; Andes Tire & Rubber Co., Cleveland; Nu-Air Tire & Rubber Co., of Cleveland; Tuscora Rubber Co., of Dover.

GOOD MONTH AT STEWART-WARNER

Chicago, Apríl 10-The Stewart-Warner Speedometer Corp. reports that its sales for March were the largest of any single month since June, 1920. The increase over March of last year is 140 per cent. The first quarter of 1922 shows 110 increase over the corresponding period of last year. Orders received for April shipment indicate that sales this month will be greater than in any April of the company's history.

NEW FRANKLIN AGENCY

Chicago, April 10-W. E. Butler, an automobile dealer in Chicago for 15 years. has been granted the Chicago agency for the Franklin, succeeding Frank H. Sanders who is retiring from business.

IN THE RETAIL FIELD

Standard Motor Car Co., Inc., Pittsburgh, has brought out a new series of the Standard eight, known as the Sterling model. Types included in the new series are the four and seven passenger touring car, the roadster, the coupe, sedan-ette, sedan and vestibule sedan.

Needham Tire Co., Boston, last week was petitioned into receivership by creditors. The matter will come up in the United States District court in a few days.

New England Branch, Boston, of the Lee Tire & Rubber Company, has leased a large sales-room and will move into it from the old quarters.

Howe Tire Co. is securing a lease of the building formerly occupied by the Falk-Baker Co., Saxon dealers, that went out of business last year.

Perfection Tire Co. opened a branch at Boston a few weeks ago with T. Robert Sullivan as New England manager, taking over the salesrooms vacated by the Boston Horseshoe Tire Company, which went out of business here.

McCarty Motor Co., Birmingham, Ala., has been employed to handle the Chandler car in been employed to handle the Chandler car in Birmingham according to a recent announcement by T. R. McCarty. The company is new, having just been organized with T. R. McCarty, formerly manager of the E. L. Scouten Motor Company, at the head.

Nickels, Jackson & Lavenberg Co., Stearns dealers at Toledo, have moved into new quarters in the building formerly occupied by the Stutz agency. Norman Moses, Stutz dealer, is moving to the Pacific coast where he will have a larger

Tracy Sales Co., Toledo, has taken over the Stephens line to distribute in northwestern Ohio. Territory will include Lima on the south and Sandusky on the east. George Wolfiin, service manager of the Davis-Bassett Co., former dealers, will be with the new company. Tracy also handles the Earl and Briscoe lines.

Consolidated Motor Co., Alabama Studebaker distributors, Birmingham, Ala., was reorganized the past week and the name of the concern changed to the Garth-Holcombe Motor Company. J. H. Holcombe, former Studebaker dealer in Savannah, Ga., is one of the officers of the reorganized concern.

J. A. Madegood, lubrication specialist of the Birmingham, Ala., Alemite agency, announces the first shipment of Oildag, and the establishment of several Oildag agencies in the city.

Southern Tire Jobbers, a new concern at Birmingham, Ala., is open for business this week. The new company is under the management of H. J. Posner and W. C. Moran and will do a jobbing business in tires and tubes and also carry a stock of accessories. A vulcanizing plant is being installed.

Inland Tire & Rubber Co. has opened a branch at Minneapolis in charge of C. M. Seaton as branch manager. The branch covers Minnesota, Wisconsin, the Dakotas and Montana.

Madden-Atkinson Co., formed some time ago to handle the Columbia, has also been made central Ohio distributor for the Paige.

Lee McGuire will handle the Franklin service and sales in Ramsey county, Minn., as the Franklin Motor Car Co.

Auto Electric Air Heater Co., Chicago, has opened a branch and station at Minneapolis, covering Hennepin county.

Republic Truck Sales Corpn. has just established a factory branch in San Francisco, and from it is conducting an intensive sales-and maintenance campaign throughout California. George E. Clarke is supervisor and manager for the entire Pacige Coast territory. R. H. Spencer is sales manager in San Francisco and Oakland; C. L. Davis is in charge of the maintenance department, and Ray Rible is wholesale represen-

Federal Truck Co., of Detroit, has opened a rect factory branch in San Francisco, with E. Jones in charge of the sales department.

Walter M. Murphy Motors Co., which has establishments in both northern and southern California, has retained the agency for the Lincoln car, according to announcement by Walter M. Murphy, on his recent return from the east. Dick Carlson is San Francisco manager for the Murphy company.

H. O. Harrison Co. has been given the agency for the Hudson and Essex for northern California and Nevada.

Oakland Motor Car Co., Pontiac, Mich., has taken over the San Francisco establishment of the California-Oakland Motor Co., and will operate it as a direct factory branch with L. S. Shoup, of the Pontiac plant, in charge as branch chief.

Eighty-Two Tire Co. has opened for business at Montgomery, Ala., handling Federal tires in Montgomery. R. M. Sharpe is in charge of the new concern. Free road service will be main-

R. H. Long Co. has opened a branch in Springfield, Mass., for the sale of the Bay State car. Small temporary quarters have been taken, with the purpose of acquiring a large sales and maintenance building soon. Thomas G. Surles, formerly with the plant, has charge of the branch. Rhines' Garage, Ware, Mass., has taken the agency for the Durant car, through the Springfield Durant Co.

Springfield Oldsmobile Co. is headed by Maj. James G. Rivers to sell Oldsmobile cars in Springfield, Mass. F. G. Webber is in charge of the maintenance division.

Kelly-Larson Co., distributors of the Maxwell and Chalmers cars, are already experiencing a shortage on these two lines. Kelly has just returned from Detroit where he succeeded in getting a few more cars than their schedule called for

Toledo Dealer Publishes Names of New Purchasers

Imposing List of 254 Sales for March—Other Dealers Report **Good Business**

T OLEDO, April 8-March brought the best month's business to Toledo automobile dealers since 1920. All sizes and makes of cars were in good demand.

The March business was led by Willys-Overland, Inc., and its three sub-dealers in Toledo with sales of 254 Willys-Knights and Overlands for the month. This established a new record for the branch here. And as a part of its advertising campaign the management has published a list of the names and addresses of the buyers. Charles E. Doan, of the Doan Motor Co., distributors of Studebakers, reports the biggest month he has ever had both in number of cars and in amount of sales in money.

Daniel Bliss, head of Bliss Auto Sales, who recently took over distribution of Hudson and Essex lines, says his business has had a rapid climb and is on a substantial basis already.

The Somerville Motor Co., reports the best business it has had in any week for two years was evidenced last week. Gardner and Elgin cars are handled by this firm.

The four local Ford dealers and many other distributors report excellent sales during March.

INVENTS AUTOMOBILE BED

Flint, Mich., April 8-An automobile bed device has been invented by Dr. Claude Eaton of this city. It insures a comfortable bed for tourists, much in the same fashion and on the same plan by means of which a Pullman berth is made.

To form the bed, the back of the front seat is lifted until the lower end is above the box of the front seat and then swung backward until it rests on supporting rods which have pulled out from the rear seat. The movement of the seat back lifts the pivotal ends of the arms into the plane of the seat back and causes the arms and the seat cushion to slide forward a short space. The bed will accommodate two or three.

Dr. Eaton says that he hopes to start a company to build these automobile hodies in Flint.

NEW DIRECTORS ELECTED

Philadelphia, April 8-The Philadelphia Automobile Trade Assn., elected nine directors as follows: For three years, Louis C. Block, J. E. Gomery and Walter G. Herbert; for two years, Walter Y. Anthony, James Sweeten, Jr., and L. S. Bowers; for one year, J. R. Pierpont, A. E. Maltby and R. W. Cook. The directors, at the annual meeting in May, will elect the association's officers.

Advises Dealers to Win the Good Will of Bankers

Washington, April 10-Cultivation of the good will of the bankers and building up confidence was emphasized as a great asset for automobile dealers by John B. Cochran, president of the Franklin National Bank, in an address to the Washington Automotive Trade Assn. here. He declared that the industry has excelled all others in rapid development within two decades and predicted that the future would witness an even greater growth.

The local dealers' organization appointed a committee to draft a resolution expressing disapproval of the dealers and the methods that brought about the resignation of William Ullman as secretary of the American Automobile Association here. Practically the entire time of the meeting was taken up with a discussion of the break between Ullman and other officials of the A.A.A. R. J. Murphy, a member of the resolutions

committee, declared that Ullman had always been one of the leading figures in highway development and in all affairs having to do with the motorist. Regret was expressed that the trade would lose the services of Ullman, who, with the late Amos Bachelder, took the initiative in many legislative victories on behalf of the dealers and car owners.

PLEDGED TO HIRE SERVICE MEN

Flint, Mich., April 8-Twelve motor car and motor car accessory plants in the city, including Buick, Chevrolet, Dort, W. A. Paterson, Armstrong Spring, Champion Ignition, Imperial Wheel, Marvel Carbureter, Flint Varnish and Color Works, Dort Body Works, Flint Motor Axle Co., and the W. F. Stewart Body Co., pledged through their officials to support the campaign to absorb the 500 jobless ex-service men estimated to be unemployed in Flint. Two hundred men have been placed by the employment department of the American Legion since the drive began.

The READERS CLEARING HOUSE

Questions & Answers on Dealers Problems

Priority of Mechanic's Lien Over Mortgage

We wish to ask your opinion in the

We wish to definition of the following case:
We sold a car and took mortgage on same, later took back the car and started broceedings. While the car are to whom foreclosure proceedings. While the car was in the possession of the man to whom it was sold it was overhauled; today the mechanic who overhauled the car is filing a lien on same and we want to know if holds over our mortgage and fore-osure.—F. F. Swinson, Pratt, Kans.

According to the amended section No. 6092 of the Laws of Kansas the Mechanic's lien is given priority over your mortgage. Section 1 of the act reads as follows:

"That a first and prior lien is hereby created in favor of any blacksmith, horseshoer, wagonmaker, keeper garage, or any other person upon any goods, chattels, horses, mules, wagons, buggies or other vehicles or automobiles and any farm implements of whatsoever kind, which shall have come into the possession of such blacksmith, horseshoer, wagonmaker, keeper of garage, or any other person for the purpose of having work on said property, or repairs, or improvements in anywise appertaining thereto, and said lien shall amount to the full amount and reasonable value of the services performed, and shall extend to and include the reasonable value of all material used in the performance of such services."

Such a law, giving the garagekeeper priority over prior recorded mortgages or other liens created prior to the repairman's lien, has been declared unconstitutional and void in Illinois and other states, and we are of the opinion that the law will not stand the test in the Courts of Kansas.

The Readers' Clearing House

THIS department is conducted to assist dealers and maintenance station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Addresses of business firms will not be published in this department but will be supplied by letter.

Technical questions answered by B. M. Ikert and P. L. Dumas; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; General Business questions, by MOTOR AGE organization in confer-

Suggestion for Sales and Maintenance Station

PLAN 378

I have decided to build a garage for sales and maintenance 50x75 ft. having an entrance large enough to meet the re-quirements of the average truck in the front of the garage and a show window on each side of this main entrance. I wish one of these rooms to be large enough to display a car and have sufficient room in the rear for an office, but it does not have to be built separate from the show window, and the other show window I wish to use for accessories display. Right back of this show window I wish to have a side entrance large enough to take care of the average truck,

so that they can drive in off of either street as it is to be built on a corner. I have lots of ground on this corner and

I would like to have it face the main road. I am going to build it out of blocks and I want it to be as attractive as possible. If you can draw me plans for this building and assist me to please the pub-lic I will greatly appreciate it.—Wilson H. Clark, Aikin, Md.

It's a bad scheme to cut your front into two parts by a center entrance. In a building no more than 50 ft, wide the space on each side of the aisle is too small for a good showroom and being divided is not so easy to attend.

Much larger buildings than this are built with no front entrance and there is no real reason for having one. If you were building for storage alone with large space and many cars going and coming all the time two doors, one entrance and one exit, would be desirable to avoid congestion. But where only a few cars a day will go in and come out, there is no use sacrificing 200 square feet of the most valuable floor space in the structure to another entrance.

As a rule, we do not recommend a corner entrance, but in this case it would probably be best because of the location of the pump. By displaying accessories on both sides many sales might be made to gas customers and profits materially increased.

As you want your building as attractive as possible and cement blocks are about the least attractive of any building material, we would suggest that you use face brick for the front and side elevation, confining the blocks to the back. It would not take a very large number of bricks as the frontage and sides are mostly glass.

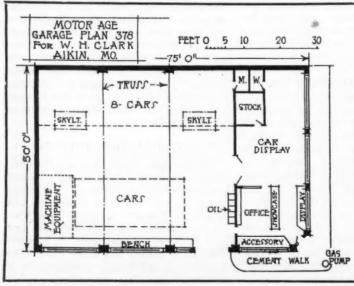
For the large area over the windows, borders and pilasters of brick around panels of cement blocks would break up the large masses which look exceedingly monotonous when built of plain blocks

The panels would be improved by a coat of tinted stucco; probably buff would look well with most bricks.

S. A. E. RATING OF LOZIER

Q—Advise the S. A. E. also brake horse-power of Lozier engine which we think is 1915 model. Engine has six cylinders casted in three. Car is equipped with Gray & Davis lighting system and instru-ments are mounted on coil board.—Mabee Auto Co., Parker, S. D.

1-The engine you describe is apparently a 1914 model known as number 77. The cylinders are 3.875 by 5.5, the S. A. E. horsepower being 36.06. Information as to the maximum actual horsepower this car develops is not available although, of course, it would be considerable in excess of the S. A. E. rating.



Plan 378-For a building 50 ft. wide it is better to place the entrance at the side as shown here. Placing it in front would be an extravagant waste of space

PERKING UP A PAIGE

Q-We have a Paige roadster 6-39 Dart-mouth model, 1918 for general overhaul with instruction to increase the power and speed of the engine all that is pos-This car is in splendid condition in every respect except that cylinder and nevery respect except that cylinder and pistons are worn so that it is necessary to install new pistons and rings. Cylinder bore is now 3½ in. How much increase in bore can be gained by reboring or regrinding and what additional power would such increase give?

2—Owner wants lighter pistons pos-

sibly even aluminum alloy. What would you recommend? How about ECL non-

expanding used by Franklin or the very light cast steel called DeLuxe?

3—Would a camshaft giving quicker action and greater valve opening help?

Where can I secure such a camshaft?

diameter much larger valve would it be possible to get by installing entire new set of larger valves? Would this be worth while?—J. W. Eichinger, Ames, Iowa.

1-We have known of cases where this model engine has been rebored to 1/8 in. larger diameter. However, we would not recommend this procedure as the cylinder castings are not uniform and there is a chance the cylinder wall will be too weak for service. The standard maximum regrinding diameter is approximately .625 or 1/16 in. The increase in power probably would be in the neighborhood of two per cent.

2-The non-expanding type of aluminum piston has met with considerable success in our present day high speed engine. A light weight cast iron piston such as the DeLuxe is considered a thoroughly reliable piston.

3-Such a camshaft as mentioned in your question would give a decidedly noticeable increase in power and speed.

4-The valve diameter could be increased by approximately 1/8 in. In conjunction with a high speed camshaft the increased valve diameter probably would allow a slightly higher volumetric efficiency. 'The increase in valve diameter would increase the total port area about five square inches.

CAR HAS HAUNTED ENGINE

Q—Explain the peculiar action of a Peerless Eight which we have been work-ing on. The engine can be idling and nobody near it and all of a sudden it will pick up as if somebody was giving it pick up as if somebody was giving it more gas and it will stay that way and on the road it will go the same perhaps all day, then all of a sudden it begins to pick up and be just as light as can be with the controls in the same place.

2—A year ago the crankshaft had about ½ in. end play but up to the present time it hasn't had a knock. Would you divise me to install new bearings?

me to install new bearings?

so, would half bearings be enough?
3—In attempting to stop some of the oil pumping what size drill would you use to drill holes in the pistons? Would a number four drill be all right and how many holes would you drill in the lower groove, as the piston has three grooves at the top only? It uses about a quart of oil every 50 miles .- Geo. D. B. Coles,

1-This condition could be caused by wear in the butterfly shaft of the carbureter or a loose butterfly valve. We would recommend that you carefully examine the carbureter after you have removed it from the car and if there is any play in the butterfly shaft or any looseness of the butterfly valve itself it should be repaired.

If there is considerable play in the butterfly shaft the vibration of the engine may cause it to bounce up and down by getting a great deal more gas which would consequently speed up the engine. Or if the butterfly valve were loose it would give different degrees of throttle opening depending on the position which it assumes.

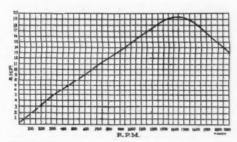
It would also be well to carefully check the ignition especially the condition of the breaker points which may have pieces of dirt on them, or the driving mechanism may have a loose key which slips at times.

2-Loose main and connecting rod bearings are the greatest cause of oil pumping in this engine. Considerable care should be used when fitting these bearings. They should be reamed at first or if a reamer is not available they

POWER CURVE FOR FORD ENGINE

Q-Publish power curve for the Ford ngine.—Otto D. Thorsnes, Lake Preston, S. Dakota.

A power curve of the Ford engine is shown below.



should be very carefully scraped securing a surface both on the edge of the bearing and on the sides of the bearing.

This is very important because oil leakage around these bearings with the pressure oiling system will cause an excessive amount of oil to be thrown into the combustion chamber. The same holds true of the connecting rod bearings, not only should the surface bearings directly on the journal be carefully fitted but also the sides of the bearing.

Entire upper and lower half bushings should be installed and approximately .0011/4 clearance should be allowed on the connecting rod bearings. This pertains to the diametrical clearance of the bearing around the journal. Probably this engine has gone far enough to have the cylinders reground.

If they are more than .004 out of round this should be done, and when the new pistons are installed they should be equipped with the same type of ring as is used by the Peerless factory, which is the Wassor ring on top and the Pressure Proof on the bottom grooves.

3-Drilling of the piston is not recommended by the Peerless factory and we would advise that you follow the suggestions given in answer to question two, particular stress being laid on the fit of the connecting rod and main bearings.

DE LA VERGNE SEMI DIESEL CHARACTERISTICS

Give operation of the 80-h.p. twin der De La Vergne oil engine type D. H. How is the starting accomplished?

2-Give information regarding the fuel What kind of fuel is used?

3- What kind of valves are used?

4—Give address of company manufacturing this engine.—J. W. Prescott, Olson, Colo.

1-The De La Vergne is of the type of stationary engine known as a semi-Diesel. Its action is as follows: The intake valve in the head opens mechanically and as the piston moves outward it draws a full charge of air into the vaporizor and cylinder. The intake valve or air valve as it is called closes and the piston returns compressing all of the air into the vaporizor to a pressure of approximately 300 pounds per sq. in.

Near the end of the stroke the coil which is atomized mechanically is injected into the combined charge of heated air which being mixed with oxygen and striking the hot surfaces of the vaporizor ignites. This ignition of the gases drives the piston forward and transmits the energy to the flywheel and at the end of the stroke the exhaust valve opens and the charge escapes.

The exhaust stroke follows forcing all burnt gases out of the cylinder. The air valve opens a few degrees before the exhaust closes and a charge of fresh air is thus sucked into the vaporizer by the outrushing exhaust gases, so that when the next suction stroke commences the vaporizer is already filled with air. As before stated this engine is semi-Diesel type four cycle and resembles in many respects an ordinary gasoline burning four cycle engine.

It differs from the Diesel type in that the air is admitted at atmospheric pressure and compressed by the engine itself whereas in the Diesel the air is usually compressed by some outside source and injected into the engine with the fuel. The starting is accomplished by compressed air. To start the vaporizer is heated.

2-The fuel pump is operated to inject the charge of oil into the vaporizer. The air valve connecting to the tank is open.

This engages the automatic starting valve which is then successively opened and closed by a cam on the lay shaft. Compressed air from the starting tank is admitted to the cylinder and forces the piston outward. When the engine gathers speed the air is shut off and the engine then operates under its own power. The fuel is generally any of the commercial fuel or crude oils.

3-The regular poppet type of valves are used.

4-This engine is manufactured by the De La Vergne Machine Co., 1189 E. 138th St., New York City. We would advise that you communicate with this firm direct for further particulars.

Relative Merits of Rotary Engine

Q—Advise what item or items make the general use of the rotary type engine such as the Gnome unsuccessful?

It would appear to me that theoretically this type engine would have distinct advantages, particularly in the line of aircraft. Its elimination of reciprocating parts and being practically air cooling without flywheel and distribution of cylinders through a circle instead of in one or more rows would seem to make manifolding easier and more even with respect to direct flow of fuel to each cylinder.

But I note that its commercial use seems to be very limited, even where mounting would be no trouble as might be the case in cars or trucks. Some of the disadvantages that have occurred to me might be the difficulties in lubrication, the possible difficulty in getting correct charges of gas into the cylinders on account of centrifugal action opposing flow of intake charge, or possibly the mechanical trouble of connecting the several connecting rods to the one crank throw and achieve mechanical and geometrical centers of throw on each. These are simply guesswork on my part, and I would much appreciate your opinion as to the items that cause this type engine to be so limited in use.—E. H. Birdsall, Thornton, Ia.

The disadvantages that are paramount in the rotary engine are first the excessive cost of manufacture. This is due to the fact that the cylinders are forged and turned-from solid billets of steel requiring the outlay of considerable expense for the labor to complete one single cylinder. The crankshaft and crankcase are also parts that are very expensive to construct they being machined from solid forging. The bearings which usually are of the Ball type are very expensive and the connecting rod design makes it very difficult to manufacture. This coupled with the fact that these engines are very extravagant in the use of lubricating oil and fuel and the fact they will not throttle down makes their use in anything but aircraft impractical. They are used in limited numbers in aircraft because of the high fuel consumption which makes it impossible to secure a wide cruising radius for the aircraft on account of the additional weight required in order to carry the necessary fuel and lubricating oil. Speaking of the Gnome type of rotary the Gnome engine is considered obsolete even for aircraft work because of its tendency to backfire and burn at the least provocation. This back firing was due to the construction of the Gnome wherein much of the raw gas was thrown out of the single valve ports. When the irregular running occurred the flame from the backfire would ignite the raw gas within the hood of the airplane often times proving fatal to both ship and pilot. Carburetion is very difficult except at the wide open throttle position which means that the speed range of the rotary engine is confined to 400 to 500 revolutions downward from the maximum speed. The oil used for lubricating this type of engine is castor oil because of its ability to withstand the cutting qualities of the gasoline. The cost of castor oil is very prohibitive compared to mineral oil. And lastly this

type of engine requires the very highest grade of workmanship to maintain the correct balance of the whole, and unless absolute perfect balance is maintained the engine will not perform satisfactorily. This same marked disadvantage holds true in the maintenance of the rotary engine, it being so sensitive to balance that unless all spark plugs installed in the cylinders are uniform as to weight there will be set up a very excessive vibration.

HOW TO CONNECT SPOTLIGHT TO PAIGE LINWOOD

Q—Instruct us through the Clearing House how to connect a spotlight to the fuse block of a 6 cylinder Paige car. This is a 1917 model known as the Linwood No. 39.—Charles R. Macomber, Providence, R. I.

1—There are two ways to connect the spotlight on this car, both of which require that one lead from the spotlight be connected to the engine or frame of the car. The other lead from the spotlight can be connected to either ammeter terminal. On one ammeter terminal the current used by this spotlight will not show on the meter, while on the other ammeter terminal it will show on the meter.

If it is desired to have the spotlight fused, the wire from the spotlight which is not grounded should be connected to the frame terminal on the switch that the tail light circuit is connected to and the spotlight can then be operated whenever the tail light is turned on which, of course, would be the case whenever use of the spotlight was required.

VALVE ADJUSTMENT ON A D-45 McLAUGHLIN

Q—We have a question concerning the adjustment of the valves on a D-45 Mc-Laughlin which uses the Buick engine. When the valve clearance is adjusted to .010 in. with the engine as hot as under normal running conditions does the valve clearance increase or decrease when the engine gets perfectly cold?—Forrest & McCulloch, Kerrobert, Sask, Ca.

The Buick engine like most over-head valve engines will show a decrease in the valve tappet clearance when the engine is cold. This is due to the fact that the greater area of the cylinder block and valve cages and their coefficient of expansion is considerably different from that of the valve stems.

From the fact that the cylinder expands considerably faster than the valve stem, when the cylinder has cooled it assumes its normal position and allows the valve stem to raise thus decreasing the clearance.

It will be noted that if the tappets on this model engine are fitted .010 when the engine is warm there be an actual clearance of approximately .002 to .003 when the engine is cold.

INCREASING CHARGING RATE OF WESTINGHOUSE GENERATOR 208

Q—Give us information that will enable us to increase the charging rate of a Westinghouse generator model 208.—Vernon Park Garage, Chicago, Ill.

1—The Westinghouse number 208 generator uses a reverse series winding on the field to limit the output, the generator being of the grounded type the action of the cutout connects the positive

brush to ground. The two terminals of the switch you show are marked L. & B., the L terminal being connected to the light and the B being connected through the ammeter to the battery.

Both of these terminals are the same therefore, except that the L terminal is directly connected to the negative brush while the B terminal is connected to the negative brush through the series winding. To increase the charging rate a connection can be made with a piece of copper wire from the L terminal to the B terminal or else both of the wires can be put on the L post.

In doing this, however, all regulation has been eliminated so that care should be taken that in summer the generator does not overheat and burn up. If this gives too much charging current a compromise can be obtained by leaving the wires on their regular terminal posts and putting a coil of iron wire between the L and the B posts which will raise the output of the generator but not entirely eliminate all regulation.

VARIETY OF MAXWELL QUESTIONS

Q—In your January 19 issue we noted answer to Morton Gottschalk, Cheyenne, Wyo. in regard to Maxwell car, 1916 model. Can we use Ward-Leonard cut-out and regulator on 1918 and where can same be purchased?

2—Where can we obtain spiral cut gears for this same model to be used in differential?

3—What cars, if any, have differential parts that are interchangeable with this rear end?

4—What rear axle assemblies can be entirely interchanged with this model without much expense and at what wrecking house are we likely to find such axles?

*5—Is there any other electrical system which can be substituted for the present Simms-Huff?

6—Where can we obtain a Briggs-Stratton cut-out for this car without buying the entire panel?—Rex White, Oswego, Kansas.

1—The Ward-Leonard cutout and regulator combination is alright for the 1918 model. Address of concerns from which it can be purchased will be suppl'ed by letter.

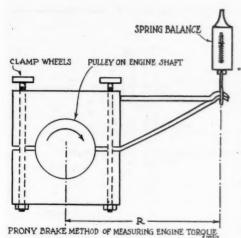
2-Information will be supplied by let-

3—The Maxwell company makes its own axle, so that it is unlikely that there are parts from other axles that could be used.

4—We know of no other rear axle that can be used. We are giving you by letter, however, information on concerns which can no doubt, supply either complete axles for Maxwell or else parts for same.

5—We do not believe it would be practical to put on different electrical systems but would suggest that you either use the Ward-Leonard combination cut out and regulator or else use a scheme which will soon appear in Motor Age. The details of this plan being sent you by letter. This scheme is one in which the regulator is eliminated and a coil of iron wire used in its place with a standard 12 volt cutout.

6-This information will be given by letter.



ENGINE TORQUE EXPRESSED IN FOOT POUNDS

Q-What is engine torque as expressed in foot pounds?

2—What is the relation between torque curve so expressed and the efficiency, pick-up and economy of the engine,—N. G. McCroden, Albuquerque, N. M.

1—What we mean by engine torque can best be illustrated by the accompanying sketch above, which shows a crude method of measuring torque of an engine. A pulley on the crankshaft is clamped between two wooden blocks in such a way that the tension is adjustable by means of two hand wheels. A projecting arm from this device extends over to a spring balance ballot and as the engine is operated the tighter the adjustment screws are set the greater will be the pull on the spring ballot.

In practice if a device of this kind is used it would be necessary to have a hollow pulley and water running in and out of it to keep it cool on account of the great amount of heat generated by the friction between the pulley and the wooden lock.

Assume now that the engine should be run with wide open throttle and the adjustment of the screws changed so as to give various readings on the spring ballot. These readings should be multiplied by the distance R or radius from the center of the engine to the spring balance ballot and this would give the torque in pounds feet, in other words it is pounds multiplied by feet.

2—When the torque as above measured has been plotted against the speed and r.p.m., it will be found to have a high spot which will be possibly at 1000 r.p.m. Of course, this point will vary on different types of engines. The maximum efficiency will be approximately at this point, assuming, of course, that the car is run with wide open throttle. This, however, being only occasionally the case, it is quite difficult to use the torque curve to determine actual efficiency in driving the car.

This high spot in the torque curve, however, means that for the amount of fuel being used the mechanical output is the greatest. The pickup and economy of the engine are also things which are difficult to relate definitely to the torque curve.

PECULIAR OVERHEATING SYMPTOMS

Q—We are using a Reo Speed Wagon, 1919 model and we are troubled with overheating. We have checked the oiling system, spark, valve timing, carbureter, water system, piston rings and valves and find them all right. As to getting efficient work from the engine when the water reaches the boiling point, it does not appear to effect the pulling power to any extent. This car has run 20,000 miles. We use medium oil in the winter and heavy oil in the summer. We also have a 490 Chevrolet which gives us exactly the same trouble.—Republic Motor Car Co., Republic, Wash.

1—Although you have stated that you have checked the water system we are inclined to think that perhaps you might have overlooked certain details of the complete cooling system. In keeping with this theory, we would offer as a suggestion that you remove the radiator and examine the water pump impeller and determine definitely whether the impeller is securely fastened to the water pump shaft.

Also when the engine is thoroughly warmed up feel with the hand over the portions of the radiator and if any portions are cool while the others are pronouncedly hot it is an indication that the radiator is clogged.

The fact that the engine performance is not impaired by the boiling we believe that this is due to the fact that some portions of this system are clogged especially the radiator. Also at the altitude of your town water will boil at probably three degrees lower temperature than it would at sea level.

You do not state whether this boiling is encountered when the car is in motion or when the engine is not pulling the car. It is possible for the overheating to be caused by friction in the chassis units, that is in the major running parts such as the wheels, transmission or clutch. By jacking up the rear axle road conditions can be approximately secured.

TESTS FOR 1913 DELCO STARTER

Q—We are writing for information concerning the starting motor on a 1913 Cadillac. When the switch is pressed which is supposed to operate the magnetic latch and cause the starting motor to turn slowly so as to mesh the gears, we find that it does so part of the time and at other times seems to have no affect, and under these circumstances the starter gears will not engage with the flywheel.

When the wires from magnetic latch are disconnected from their terminals and connected to each other the starting motor will turn over every time. The battery is in good shape and turns the engine over all right. The charging rate is also alright and the overrunning clutch releases as it should. Can you tell us what is wrong? It seems to us that the current is too weak. The ammeter showing a discharge of about 6 amperes every time button is pressed.—W. H. Slaight, Fairbury, Ill.

Would first suggest your using an ammeter capable of reading 10 or 15 amperes, connecting it in the circuit by removing one wire only from the magnetic latch and connecting it to the ammeter. Then take another piece of wire and connect from the other ammeter ter-

minal to the terminal of the magnetic latch which has no wire on it. This will put the ammeter in circuit so as to read the current through the coil which is supposed to operate the magnetic latch.

The button should now be operated and the indication on the ammeter watched very carefully, as it is possible that there is a loose connection and if so it may show up on the meter, being noted in an unsteady reading where the needle will perhaps stay at 6 amperes for awhile and then drop down to 5½, jump around a bit and then come up to 6, indicating by its erratic actions that the circuit contains a poor connection at some points.

In making this test if at sometimes no current should be observed on the meter when the button is operated, it is evident that there is an open circuit which from the symptoms you described, would say is in the windings of the magnetic latch itself, inasmuch as starter always turns over when the latch coil is eliminated from the circuit.

Another way of checking up conditions at the latch coil, is to use a voltmeter connected across the terminals of this coil with all other wiring left normally connected. In making test with voltmeter the readings at the magnetic latch coil added to the readings taken at the generator should add nearly to the voltage at the battery, indicating that there is a little loss of voltage in the wiring.

If the two electrical tests above indicated do not seem to show up any abnormal conditions, we would suggest your checking up the condition of commutator and brushes, sanding the surface of commutator end brushes if necessary to get a good clean connection, as it may be possible that a slight amount of resistance at this point would cause the trouble you described and would be neutralized in the test you made when the resistance of the latch coil was eliminated.

It is also possible that there is a poor contact in the starter switch, as the current for the latch coil comes through this switch. When the starter switch is inspected, there should be found a slight spring to the contact, and if the surfaces seem burnt, they can be cleaned up by removing the two screws that hold the contact block, and sliding it back and forth, using some valve grinding compound to brighten up the surfaces. The contact will be improved if the block is turned around from its present position.

ENGER 12 CYL. CAR INFORMATION

Q—Give make of engine, bore and stroke, carbureter, ignition, starting and lighting, of the Enger 12 cylinder car, also the year this car was made.—F. R. Mitchell, Chicago, Ill.

The bore of this engine was 2% in. and the stroke 3½ in. the engine was made by the Enger Co. This engine was equipped with a Zenith carbureter, Westinghouse starting and lighting and Remy ignition and built in 1916.

EXTENSIVE MISCELLANEOUS INFORMATION

Q-1. Is the Murray car being manufactured today?

A—1—Yes, by the Murray Motor Car Co., 85-87 Church St., Boston, Mass.

2—What kind of engine was used in the Beacon car manufactured by the Standard Steel Car Co.?

2-No information is available on this car.

3—What kind of pistons would you recommend to be used in an Oakland 34B-1919. Aluminum or cast iron? Which will give the best service, speed?

give the best service, speed?

3—It is counter to the policy of this magazine to recommend any certain article. Both types of pistons have advantages. You can't be far wrong if you use the factory stock pistons if the car is to be used for all around work.

4—What would you think of the De Luxe or Kant Skore piston for this car?

4—Both of these pistons are well known and as far as we have heard both give satisfaction.

5—If possible give weight of the Oakland regular cast iron piston, Oakland aluminum piston, De Luxe and Kant Skore piston?

5—The regular cast iron piston weighs 18 oz., the Kant Skore piston which is regular equipment for 1922 weighs 8 oz. These weights are for piston only without rings. The DeLuxe piston weighs 13 and one-half ounces. The Kant Skore weighs the same as the Lynite piston.

6—Publish illustration of Oakland 34B-1919 rear axle unit, clutch and transmission.

6—These are shown in Figures 1, 2 and 3.

7—Give directions for timing valves and ignition on Oakland 1919.

7—To time the valves proceed as follows: Turn flywheel to mark I. O. I-6 when inlet valve of cylinder No. 1 should open, continue to turn flywheel 200 degrees to mark I. C. I-6, at which point the inlet valve should just close. At this point there should be a clearance of

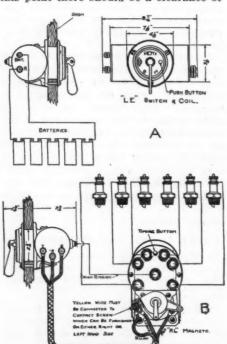
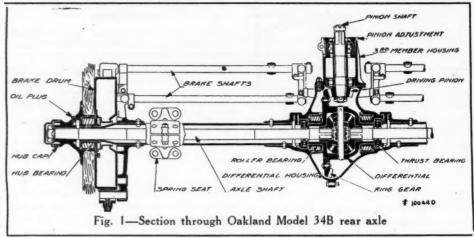


Fig. 4—Wiring diagram Remy Model RL magneto, using Remy coil



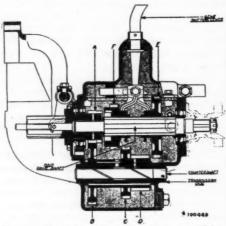


Fig. 2—Drawing of transmission assembly, Model 348 Oakland

.008 in, between valve rocker arms and end of valve stems.

8-Explain operation of thermostat on Remy generator.

8-With the engine cold the generator begins charging at its maximum rate and after a period of running, depending entirely upon the speed, atmospheric conditions and battery conditions the thermostat points open due to the greater expansion of the brass side of the blade and when these points open the thermostat resistance is inserted into the shunt field thus reducing the charging rate. It will be seen that the thermostat points may open after a few minutes operation, if the weather is warm and the battery fully charged or not at all if the weather is extremely cold and the battery low.

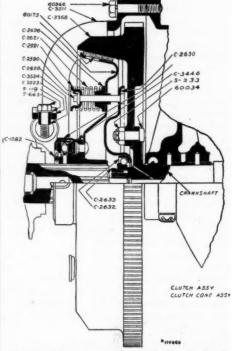
9—Does the generator drive from the crankshaft or the camshaft on the 83B Overland?

9—The generator is driven by a chain from the crankshaft.

10—Instruct how to make a magnet charger to operate on a 6 volt battery.

10—At right in Fig. 6 are shown the specifications that will be followed for using six volts as the source of current. The poles AA are made of cold rolled steel three-quarters by one and one-half inches and five and one-quarter inches long. The core B is one and one-quarter inch in diameter cold rolled steel two and five-eighths long with its opposite ends faced off.

Through the center is the hole for the



ig. 3—Cut away view of Oakland clutch as used on the 1919 Model six

three-eighths inch bolt as shown which clamps the whole thing together. The winding C is retained on the core by one-eighth inch fibre washers two and three-quarters outside diameter and one and one-quarter inches inside diameter with a press fit on the core B. After thoroughly taping the core to prevent grounds, the spool is ready to be wound. Start the wire in hole E. For a six volt winding use one and two-thirds pounds of copper magnet wire No. 12 D. CC. For good results wind a layer of stiff paper between each layer of wire.

11—Publish wiring diagram for a Splitdorf Model D type E magneto.

11-This is shown in Fig. 5.

12—Publish wiring diagram for Remy model RL four cylinder magneto.

12-This is shown in Fig. 4.

13—Publish wiring diagram for a German Bosch type ARH magneto, No. 398956.

13—This magneto is of the low tension type, for use on make and break ignition systems. It has only one binding post which is connected by wire to the mechanical make and break on the engine.

14—Will any of the above magnetos make a lighting generator without rewiring the armature? I find the Splitdorf magneto generates enough current to light a 12-16 volt automobile headlamp when running at low speed. I also find that the German Bosch will light a 120 volt 40 watt lamp run at low speed. Will it hurt these magnetos to use them for lighting generators. Is there any way that I can make them give a steady light without the flicker that they now have?

14—No. These magnetos should not be run as generators. They will not operate without flickering as they have no commutator.

15—Where can I obtain parts for a 1913 Metz roadster?

15—From the Waltham Motor Mfg. Co. Inc., Waltham, Mass.

16—I am using an Auto-Lite type G-D generator for charging batteries from a small stationary engine and want to know if I can use a small battery rheostat to regulate the current output. This is the kind of rheostat you buy for about a dollar. If so furnish wiring diagram.— Reader.

16—This is shown in sketch mailed to you. Two or more of these small rheostats will probably be required.

CHARGING FORD MAGNETS

Q—Can we charge Ford magnets from a North East 12-16 volt generator, or from 12-16 volt storage battery without special apparatus?—H. S. Bredow, Tecumseh. Mich.

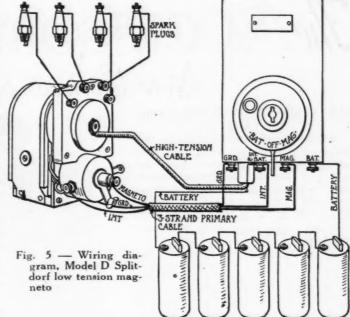
The voltage required for this work is generally considered to be 24 volts, although up to 30 or 32 volts can be used with care, the danger being that the contact will be made too long and the coil insulation will be thereby affected. The North East Generator while having somewhere near the right voltage does not have the ability that the storage battery has of giving out 50 or 60 amperes, which the magneto winding is capable of taking for short periods without bad results. The use of two 12-volt storage batteries connected in series is

therefore recommended, the positive lead being connected to the magneto terminal post, the wire being disconnected from that post.

Before the negative lead from the battery is flashed to the frame of the car, it is very important that the flywheel be set so that the magnets are in the right position, for unless this is done there is just as much chance of weakening the magnets as there is of improving them.

To set the flywheel correctly, the spark plugs

should be removed to get rid of the compression so that the crank can be turned a little bit at a time. A compass should then be used on top of the flywheel housing, about two inches back of the magneto terminal and about 1% in. to the left (the side toward the pedals). The flywheel should be turned with the crank until the end of the compass that naturally turns north is pointing toward the front of the car. If a further check is desired it can be made by removing the slanting door on the transmission housing and looking at the ends of the brass screws which show on the back of the flywheel rim. of these should be at the right of the center of the car and another the same distance to the left.



With the flywheel thus properly set, it is now necessary to flash the negative lead from the batteries to the frame of the car some fifteen or twenty times, making sure that this wire is not left on for any length of time but merely flashed against the frame.

For a very thorough job the crank should then be given a quarter turn, the position checked with the compass, and the operation repeated, this being done at every quarter turn of the crank. This is advisable due to the fact that the magnets and the cores of the coils spring together more at the lower part of the flywheel than at the top, and therefore get more strongly magnetized. Repeating the operation gives all the magnets a chance to become strongly magnetized.

PARTS FOR 1917 OLYMPIAN

Q—We have on hand an Olympian touring car of 1917 model. This car has ring gear pinion and one axle stripped. The people who built this car are out of business and as it is an assembled car we would like to have names of other cars using same axles and gears, so that we can buy repair parts and save about thirty dollars.—Tatum-Clifton & Co., Cedar Bluff, Ala.

A—The type of axle used was made by the Peru Auto Parts Co., Peru, Ind., and we find that Peru axles were also used by Dixie and Crow-Elkhart, and it is possible that from concerns handling parts for these cars that you may be able to get the parts you require.

NO WORKING DRAWINGS FOR CALIFORNIA TOPS

Q—Please advise if you have general working drawings of California or other permanent tops to fit a Ford. If so, state cost of such drawings.—Geo. E. Brennan, Los Angeles, Calif.

We regret to advise that we have no such drawings available.

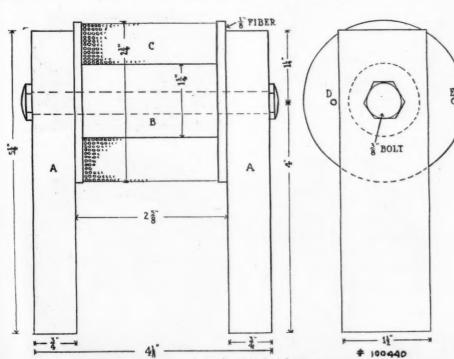


Fig. 6-Dimensional drawing for constructing magnet charger

The ACCESSORY SHOW CASE

New Sources of Retail Profit

MAIS CYLINDER HEAD FOR DODGE

Intended for application to Dodge cars this head is furnished with large sized valves. The diameter of the intake valve is 2 1/16 in. and the exhaust valves are 1 15/16 in. in diameter. The rocker arms are offset at the pivot to give a lift of 7/16 of an in. with the standard camshaft. The valve seats are water jacketed.

Extra long valve guides are used and the tungsten valves are held onto their seats by double valve springs. All passageways are fully surrounded by water and are of full section. The head is so designed that two carbureters of %-in. size can be fitted. John A. Mais Mfg. Co., 24 Woodland Drive, Indianapolis, Ind.

UNIVERSAL HEATER CUT-OUT

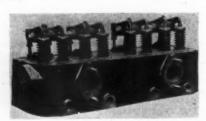
The Universal Heater Cut-Out is made in two pieces, the flap being made of heavy steel and machined to fit perfectly. The flap is notched so as to fit snugly on the inside of the exhaust pipe, and when opened, completely shuts off line to the muffler.-Waller Mfg. Co., Oelwin, Ta.

SCHWARTZ TOWN PLATE

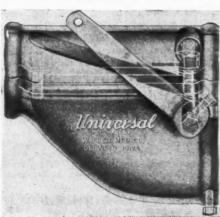
The town plate is illustrated by a drawing here. I. S. Schwartz Co., 431 S. Dearborn St., Chicago, Ill.

TEL-U-LEVEL OIL GAGE

This gage is attached to dash and tells the level of the oil in the system. Berge Rathbun Co., 4 Alden Court, Boston, Mass.

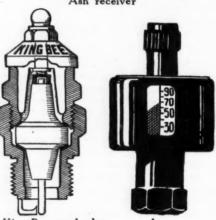


Mais cylinder head for Dodge cars

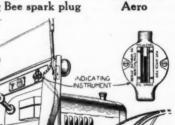


Universal heater cut-out

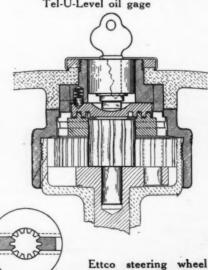




King Bee spark plug



Tel-U-Level oil gage



lock for Fords

AERO

This instrument is an individual meter for each tire. It is screwed onto the valve stem and stays there as long as the tire is in use. On its face is a small indicator that tells the pound air pressure in the tire. When the air is needed it is pumped through the meter which has a nonleak-able value in the end of it. Aero Mfg. Co., 1410 Wrightwood Ave., Chicago.

KING BEE SPARK PLUG

The King Bee spark plug insulator is protected by an armor of steel, the intensifier is self-adjustable in an airtight chamber. Price \$1.50.-King Bee Spark Plug Sales Co., 2502 Cass avenue, St. Louis, Mo.

VAN CAST STEEL WHEEL

The Van Cast steel wheel shown here, is for Timken axle, one-ton truck type with Morand demountable cushion element.-Van Wheel Corp., Syracuse, N. Y.

ETTCO STEERING WHEEL LOCK FOR FORDS

The diagram printed on this page shows the Ettco steering wheel lock for Fords manufactured by Eastern Tube & Tool Co., Brooklyn, N. Y. Price \$15.

ASH RECEIVER

The ash receiver pictured here can be attached to dash, door or wherever desired. It is so made that ashes cannot blow out. Price \$1. Cuno Eng. Corp., Meriden, Conn.



Schwartz Town



Van Cast steel wheel

SERVICE EQUIPMENT Aids for Time Saving & Accuracy

KEYSTONE REAMER

The Keystone expansion reamers are of special value in piston pin work for reaming bushings. They come in various sizes to fit practically all the more popular makes of cars and trucks, and can be had with or without a pilot. When furnished with a pilot front and rear, the latter insures a perfect alignment of the pin. The chucking flute end of the front pilot removes any burr caused by forcing the bushing in place and at the same time centers and reams an accurate fit for the front alignment pilot. Keystone Reamer & Tool Co., Millersburg, Pa.

HANDIMAN ELECTRIC HOIST

Current for this machine may be supplied by a flexible conductor from convenient sockets or suspended from the hoist if more desirable to bring feeders to that point. The machine balances itself, weighs about 160 pounds and is easily handled. The gears are hardened and run in oil. It can be furnished for operation on both alternating and direct current by the New Jersey Foundry & Machine Co., 90 West Street, New York

STEVENS CYLINDER BUSHING SET

This cylinder bushing set supplies a method of replacing stripped threads in the Ford cylinder block. Complete set, \$3.50. Stevens & Co., Broadway, New York.

WHITNEY VALVE REFACING LATHE

Whitney valve refacing and reseating tools are made by the R. S. Whitney Mfg. Co., 74 Nichols St., Lewiston, Me.

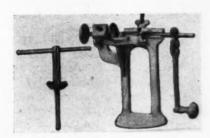
SURE GET 'EM MAGNET

A magnet which is used for getting tools, nuts, etc., out of the transmission, motor or clutch, when accidentally dropped in. Price, \$5.-R. H. & H. C. Gray Co., 1315 Fifth Ave., Seattle, Wash.





Sure Get 'Em Magnet



Whitney valve refacing lathe

PEXTO ADJUSTABLE ANGLE WRENCHES

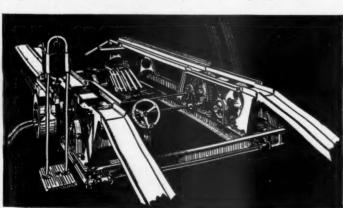
Three or four various sized angle wrenches, adjustable to any size pouched in a canvas bag are the product of Peck, Stow & Wilcox Co., Southington, Conn.

JOHNSON STARTING, TESTING AND RUNNING-IN MACHINE

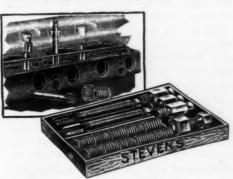
The following tests and adjustments can be made in the shop with this machine: Run in new pistons and bearings without removing engine, carbureter adjustments under any load or at any speed, locate squeaks and rattles. detect wabbly wheels, make gasoline and oil consumption tests, test and inspect electrical and mechanical equipment. Instruments and charts are provided to enable instant readings on miles per hour, revolutions per minute and all data on horsepower. This machine also combines the features of a work rack. A car mounted on this rack is raised 21 in. above the floor. Work under the car is facilitated by a seat with adjustable head rest and mounted on wheels running in channels which permit the seat to be moved from side to side and from end to end of the rack. Jack stands can be placed at any point above the channel runways and wheels can be removed with the use of the ordinary jack. Runboards allow other workmen to work on parts above the car frame. These racks are built of steel and gray iron castings and are made in three types to take all makes of cars whether equipped with pneumatic or solid flat tires. Johnson Automotive Service of America, 984 Central ave., Minneapolis.

HANDYHAND FOR DUSTING AND POLISHING

The virtue of the Handyhand is in the quality of the material used, and the way it is made. It is manufactured from a specially selected lamb's wool skin, tanned and treated by a process which gives it elegant texture for a polishing Chas. J. Geis, 1432 Woodsurface. haven Ave., Woodhaven, N. Y.



Johnson starting, testing & runningin machine



Stevens cylinder brushing set



Are You Interested in Highways? Then You Should Have This Pamphlet

An Outline of Highway Economics for Use in Schools of All Grades in the Development of This New Educational Subject

A COMPREHENSIVE outline of highway transport from the time when aboriginal man discovered the first wheel to the present moment, has been prepared by Professor Lewis W. Mc-Intyre, Assistant Professor of Civil Engineering, University of Pittsburgh, for the Highway and Highway Transport Education Committee.

Although making no pretense of being complete, the outline treats exhaustively of the various phases which make Highway transport one of the dominant subjects of the day. It was prepared at the urgent insistence of schools of engineering and economics, highway engineers and highway officials. The outline is expected to be the forerunner of text books on the subject, to which many of the leading economists and engineers in the country are giving their attention.

In Five Divisions

The outline, published in pamphlet form, may be adapted for classroom exercises and lectures, or it may be used by engineers and business men actively engaged in the manufacture of motor vehicles or the construction of high-ways.

Subdivided into five divisions, the outline treats of the field of highway transport, the highway and the motor vehicle, legal phases of the subject, principles of successful operation and the selling of transportation.

One of the subdivisions deals with the inter-relationship of highways, railways and waterways, showing how the transport trinity may be so coordinated that the most effective distribution of commodities may be attained.

The relationship of highway transport to traffic engineering and city planning, treated in the outline, opens a broad field of speculation, presently to become to economists, engineers and investigators the subject of specific analysis.

One of the most immediate phases affecting highway transport, the distribution of traffic and the safety of the

pedestrian and the motorist, is treated at some length, the views of men and women who have given considerable time and thought to this subject having been previously ascertained. Historically, the outline goes back to ancient days when loads were carried on the backs of men and women, treating successively the coolie labor, South African negroes, pack animals, the invention of the wheel, and presently, its evolution into carts, chariots, and the motor vehicle of today.

Criticisms Welcomed

As a preface to the outline, Professor McIntyre says:

"The outline makes no pretense of being either complete or adequate. It has been limited in various ways. The newness of the subject and the consequent lack of authoritative research make definite conclusions and principles impossible. An effort has, therefore, been made to avoid the expression of an opinion, but to present both sides of debatable questions. Some of the topics are capable of considerable expansion; their use will be determined by the local situation. Others may be used almost as outlined. It is confidently expected that use of the outline will develop innumerable suggestions for its revision. Such suggestions or criticisms will be greatly appre-

One of the features of the outline is the bibliography that follows the topics under each subhead. Another that is expected to be of definite value to the motor transport operator are the chapters on costs, dispatching and route. The selection of the motor vehicle, dealing with general requirements, type, body design, trailers and tires, will prove, it is said, an invaluable asset to the prospective purchaser of motor trucks.

Where Booklet Can be Obtained

The booklet is being distributed by the Highway and Highway Transport Education Committee, first to colleges and universities and then upon request to manufacturers and business men. It is interesting to recall that the committee, appointed in May, 1920, by Dr. P. P. Claxton, then Commissioner of Educa-

tion, has been able within a comparatively brief period of time to enlist the interest of engineers and economists in a field of transportation held to be an increasingly important factor in the national life.

The sole function of the committee is the study of highway transport in its abstract phases, and to that end consists of men qualified by experience and training to undertake the study, and to encourage it.

Dr. John T. Tigert, United States Commissioner of Education, is chairman of the committee. Other members are Thomas H. MacDonald, Chief, Bureau of Public Roads, Department of Agriculture; Colonel F. C. Boggs, Corps of Engineers, U. S. A., representing the War Department; Roy D. Chapin, representing the National Automobile Chamber of Commerce; F. L. Bishop, Dean of Engineering, University of Pittsburgh, representing the Society for the Promotion of Engineering Education; Harvey S. Firestone, representing the Rubber Association of America; W. S. Keller, State Highway Engineer of Alabama. representing the American Association of State Highway Officials; H. W. Alden, representing the Society of Automotive Engineers; W. C. John, acting director; and Pyke Johnson, secretary.

The booklet is being distributed by the committee from its offices in the Willard Building, Washington, D. C.

CAPITALIZING PUBLIC INTEREST WHILE IT IS AT WHITE HEAT

A live dealer "on his toes" can do things quite often that will call his business to the attention of the community with its resultant increase in sales. Taking advantage of the public's intense interest in the radiophone, Michael Woll, accessory dealer and maintenance station owner, Chicago, will install one of these outfits in his place of business and use it as a good will builder and source of attention. He is taking the telephone number of all customers coming into the building and when the outfit is ready will call them to enjoy a concert through this mystifying and entertaining invention.

COMING MOTOR EVENTS

AUTOMOBILE SHOWS Asbury Pk., N. J. Automobile Show Apr. 10-15 Johnstown, Pa... Automobile Show Apr. 10-15 Butte, Mont... Automobile Show Apr. 15-23 Wins.-Salem, N.C. Automobile Show Apr. 11-17 Columbia, S. C... Automobile Show Apr. 17-22 Goldsboro, N. C. Automobile Show Apr. 18-22 Mitchell, S. D... Automobile Show Apr. 20-22 Mt. Vernon, Ill.. Automobile Show Apr. 24-30

Chicago Used Car Show Apr. 26-May 4
Williamson, W. Va. Automobile Show May 10-13
Hartford, Conn... Automobile Show Sept. 4-9

FOREIGN SHOWS

Mexico	City Aut	omobile Show	***************************************	Apr. 16-23
Rio de	Janiero Aut	omotive Exhibi	ition	Sept., 1922

CONVENTIONS

Colo. Spgs., Colo Automotive	Equipment	AssnJune 9-24
White Sulphur		
Springs, W.VaS. A. E. Su		
Olympia Washington	Automotive	Trade Assn July 21-22

RACES

San Carlos, Cal "Golden	Gate Derby"	Apr. 16
Indianapolis 500-Mile	Classic	
Colo. Spgs., Colo Pike's Po	eak Race	Sept. 4
San Carlos Cal 500-Mile	Armistice Day Re	ce Nov. 11



Where Detroit Dealers Discuss Their Joy and Grief

THE Detroit Automobile Dealers Association has gone in for housekeeping, or rather club keeping, after many, many years of unity during which, for want of a better term, they might have been said to be boarding.

The new clubrooms in the Hotel Addison, practically in the center of the Detroit automobile district, will be matched against the quarters of any automobile association in the country, room for room, and no holds barred.

Accompanying photographs give an idea of the general completeness of the headquarters. There are four business offices like the one pictured, all furnished in mahogany, and all intended to conduct business in.

Across the lobby are the lounge room, card room and lunch room of the asso-

ciation, the lounge furniture being specifically designed to rest bodies and minds wearied with sales problems.

The card and lunch room can be thrown together to provide a long room for organization dinners such as will be held on meeting nights and such as was held recently in opening up the rooms. No more convivial meeting of was held recently in opening up the the principal reason for the conviviality was the "at home" feeling.

President Guy O. Simons welcomed everyone and urged that they use the place always. "Daily luncheons will be served, eat here as often as you can and bring your problems here to talk about while you eat," he urged. "Hold your staff meetings and your conferences

here," he said, "and we'll know that you know what the rooms are for."

The house committee of the association, headed by Walter Bomb, with C. A. Triphagen and Howard Bauer as associates, with the directors of the association, will get a questionnaire which is designed to ascertain from members just how the headquarters can be used so as to be most beneficial in a business way.

One of the plans the association has is to create a membership in the club which will be offered as a reward of merit to the salesmen and department workers of the dealer members. It is expected that the club will prove a valuable factor in keeping record of performance by all salesmen and that through it undesirable practices in the past can be avoided.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons	Chassis	Bore and Stroke	TIRES Front Rear	Final Drive	NAME AND MODEL	Tons	Chassis Price	Stroke	Front R	Final Drive	NAME AND MODEL	Tons	Chasnis Price	Bore and Stroke	Front	RES
Acason Acason, RB Acason, H Acason, L Acason, M Ace, C Ace, A Acme, G Acme, B Acme, F Acme, F	34-1 11/2 21/2 31/2 5 11/4 21/2 11/2 21/2	\$1650\$ 1950 2750 3450 4350 2295 2795	334x5 334x514 436x534 436x534 5 x614 334x5 414x512 334x5 334x5 334x5	34x5† 34x5† 36x6³ 36x6* 36x6* 36x6* 36x10* 36x6 40x12* 34x5\\$2\$x4x3\\$2\$x4x3\\$2\$x4x3\\$2\$x4x3\\$2\$x4x3\\$2\$x4x3\\$2\$x4x3\\$2\$x4x3\\$2\$x4x5	W W W W W W W	Concerd, A Concerd, B Concerd, BX Concerd, BX Cook. 51 Corbitt, E-22 Corbitt, D-22 Corbitt, B-22 Corbitt, R-22 Carbitt, R-22 Carbitt, R-22	2 3 2 3 2½ 1 1½ 2 2½ 3	3600 1480 2200 2600 3000 3200	4 x51/2 41/4x51/2 4 x51/2 4 x51/2 41/2x51/2 4 x51/3 33/4x5 33/4x5 41/6x51/4 41/2x51/2 41/2x51/2	36x3½ 36x 36x4 36x 36x3½ 36x 36x4 36x 36x4 36x 34x3½ 34x 34x3½ 34x 36x3½ 36x 36x4 36x 36x4 36x	8 W 8 W 8 W 8 1 4 W 4 W 6 W 7 W 8 W	Gary, I Gary, J Gary, K Gary, M Gersix, M Gersix G Golden West, GH Golden West, G	11-11-11-11-11-11-11-11-11-11-11-11-11-	\$2600 2900 3800 4900 5900 3100 3500 4500 4500 5000	334x5 4 x51/2 41/4x51/2 41/2x6 5 x61/2 4 x51/2 41/2x6 41/2x6 41/2x51/2	36x3½ 36x3½ 36x4 36x5 36x6 36x3½ 36x4 36x5 36x7 36x6	36x4 36x5 36x7 40x5d 40x6d 36x7 36x8 40x12 36x7 36x6
ceme, AC ceme, C ceme, C ceme, C ceme, C ceme, E comerican, 25 cemerican, 40 pez, G pez, G pez, D pez, E comerican, 40 pez, C pez, G pez, C cemerican, 40 pez, C cemerican, 40 cemerican	2 4 1 4 4 4 4 4 4 4 4 4	3350 4275 1450 1915 2695 3975 22425 3200 4150 1185 2475 3175 3975 1950	418 x 51 / 4 / 5 x 51 / 6 x	36x4 36x7 36x7 36x6 36x6 40x10 36x6 36x4 36x5 36x4 36x5 36x64 36x5 36x5 36x5 36x5 36x5 36x5 36x5 36x5	W W W W W W W W W W W W W W W W W W W	Corbitt, A-22 Corbitt, AA-22 Day-Elder, AS Day-Elder, B Day-Elder, C Day-Elder, F Day-Elder, F Day-Elder, F Dearborn, G Defiance, D Defiance, D Defiance, D DeMartini, 2 DeMartini, 2 DeMartini, 2 DeMartini, 3 Denby, 33 Denby, 34 Denby, 35 Denby, 35 Denby, 37	314-4 5 1 112 2 1 12 3 5 1 1 12 2 1 2 2 1	2180 2590 1695 § 2095 § 2275 § 2600 3300 4250 4800 1485 2145 2395 3895	**************************************	36x5 36, 36x3 4 30, 36x4 36, 36x5 36, 36x5 36, 36x5 36x5 36x5 36x5 36x5 36x5 36x5 36x5	6d W W 55 W W 112 W W 112 W W 112 W	I-Ten Graham Bres. 13/2-Ten 13		1325 1365 1906 25005 2925 3275 3275 3995 4225 1900 2225 2900 3500 3500 3500 3000 3100 3275 4100	374x414 374x415 334x5 334x5 334x5 414x514 412x514	33x41/2 33x41/2 33x5† 36x31/2 36x31/2 36x4* 36x6 36x6 34x5* 36x6 36x6 36x6 36x6 36x6 36x6 36x6 36x	33x5† 36x5* 36x7* 36x4d* 42x9† 40x6d* 34x5* 36x60* 36x80* 36x10* 40x12 38x7† 38x7† 38x7† 36x6 36x30*
utocar, 21UG utocar, 27H utocar, 27K2 utocar, 26Y utocar, 26P vailable, H1: vailable, H2: vailable, H3: vailable, H3: vailable, H3: vailable, H3: vailable, H5: very eck, A Jr. eck, C ell ell, M	12/6-2 2 2 5 5 11/6 2 2!4 3!6 5 1	2050 2950 3075 3350 4100 2175 2775 3160 4175 5375 1950 2550 1000 1495	43 x 4 1 2 4 x 5 1 2 4 x 5 1 2 4 1 4 x 5 1 6 4 1 4 x 5 1 6 4 x 5 1 6 3 x 5 x 5 1 6 3 5 x 5 5 6 3 5 x 5 5 6	34x5 34x5 36x7 34x5 36x7 34x6 36x1 36x1 36x1 36x1 36x1 36x1 36x1 36	D D D D W W W W W W I I B W	Dependable, A Dependable, C Dependable, D Dependable, E Diamond T, G-3 Diamond T, T Diamond T, T Diamond T, K Diamond T, L Diamond T, L Diamond T, S Diebl, A Diebl, B Dispatch, F Doane	5 34-1 2 21/2 3 1-11/4 11/2 2-21/2 5 5 1 11/2 11/2 11/2 11/2 11/2 11/2	4295 1650 2350 2650 2950 1975 2525 2250 2650 3750 4325 4500	394x5)4 4 x5)5 414x5)5 334x5)4 334x5)4 4 x5)4 414x5)5 1134x6 315x5 315x5 315x5 414x5)4	36x6 40 36x6 40 34x4½ 35 36x6 36 34x4† 34 36x5 36	166 W 155 W 166 W 167 W	Harvey, WOA Harvey, WFA Harvey, WHA Hawkeye, K Hawkeye, M Hendrickson, O Hendrickson, N Hendrickson, M Hendrickson, K Huffman, C Huffbart A Hurlburt B	2 2 3 1 2 3 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 2 3 5 1 1 1 2 3 5 1 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5 1 1 2 3 5	5100 5100 2650 2950 3950 1850 2650 3700 2000 2690 3000 4000 1995 1795 2850 3750	11-2x5;2 11-2x5;2 11-2x5;2 11-2x6;4 11-2x6;4 11-2x6;4 11-2x6;4 11-2x6;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4 11-2x5;4	36x5 36x5 34x4 36x4 36x5 36x5* 36x5* 36x4* 36x5* 36x4 36x54 36x34 34x312 34x312	40x6d 40x6d 34x7 36x7 36x5d 36x6* 36x10* 36x10* 36x7* 36x5d 40x6 34x6 34x6 34x6 34x5 36x4d
ell, E ell, O elmont, A elmont, D elmont, F essemer, G essemer, H-2 essemer, J-2 essemer, K-2 ig 4, H ig 4, T ig 4, H x ig 4,	23 1 1 2 2 4 4 7 7 7 1 1 2 2 1 3 3 5 1 2 2 2 3 3 3 5 1 2 2 2 3 3 5 1 2 2 2 3 3 3 5 1 2 2 2 3 3 3 5 1 2 2 2 3 3 3 5 1 2 2 2 3 3 3	2100 2550 725 2575 3500 1395 1995 5000 6000 6000 1500 2250 2975 3700 4250 4254	374x55 146x455 374x55 374x55 374x55 116x5 116	34x4 31x4 31x4 31x4 31x4 31x3 31x4 31x3 31x4 31x3 31x5 31x6 31x6 31x6 31x6 31x6 31x6 31x6 31x6	W W W W W W W W	Eagle, 100-X Eagle, 100-2 Erie, E Erie, A F.W.D., B Facto, 1921 Fageol, 2\frac{1}{2} Fageol, 3\frac{1}{2} Fageol, 3\frac{1}{2} Fageol, 5 Fageol, 5 Fageol, 5 Fageol, 5	31/2 6 1/2 2-21/2 31/2 31/2 21/2 21/2 21/2 21/2 21/2	5100 6000 730 730 7400 4400 4400 2775 3500 1590 2275 2420 2295 3000 5700 1900 1800 2175 2425 3150 4500	49 6 1 5 3 6 6 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	32x4† 32 36x4 36 31x4 31 35x5† 38 34x3; 36x3 34x3; 34x3 36x6 36x4 36 36x4 36 34x3; 34x3 36x6 36x4 36 36x6 40 35x5† 38 36x6 36x4 36 36x6 36x4 36 36x6 40 36x6 40	66d C B B C C C C C C C C C C C C C C C C	Hutlburt D Indep'd't(lowa), B Indep'd't(lowa), G Indep'd't(low), G Indep'd'(Ohio), F Indep'd'(Ohio), H Indep'd't(Ohio), M Indep'd't(Ohio), M Indep'd't(Ohio), M Indiana, 25 Indiana, 25 Indiana, 25 Indiana, 35 Indiana, 51 Inliand, D International, 31 International, 21 International, 41 International,	1116	4590 5500 1065 2040 2940 2385 3085 3085 2950 1500 1750 2100 2400 2400 3600 3250 2425 2425 3090 3590 3590 3590 3690	11/2x6	36x5 36x5 34x31/2 34x31/2 36x4 36x4 36x5 36x5 34x5 36x5 34x5 36x5 34x5 36x31/2 36x31/2 36x31/2 36x31/2 36x31/2 36x31/2 36x31/2 36x5 34x5 36x5 34x5 36x5 36x5	36x5d 40x6d 34x4 34x5 36x4d 36x5d 34x5 36x7 36x84 40x6d 34x6 34x6 34x6 34x6 34x6 34x6 34x6 36x7 36x5d 34x6 36x7 36x5d
Lase Champion Light Commercial Chevrolet, G Chicago, C1½ Chicago, C2½ Chicago, C3½ Chicago, C3½ Chicago, C3½ Chicago, C3½ Chicago, D5 Clydesdale, 20 Clydesdale, 22 Clydesdale, 65EX Clydesdale, 55EX Clydesdale, 120B Collier, 19 Collier, 12 Collier, 21 Collier, 22 Columbia, H Columbia, G Commerce, T	2 11 21 21 21 21 21 21 21 21 21 21 21 21	1150 745 1125 2450 1890 2385 2175 3250 4100 1850 1950 2435 2435 2435 2435 1950 2435 1950 2435 1950 2435 1950 2435 1950 2450 2450 2450 2450 2450 2450 2450 24	414x8 414x8 314x4 314x4 4 x814x6 4 x814x6 4 4x814x6 414x814 414x81	30x0 38x7 32x3½ 32x3⅓ 31x4† 34x4⅓ 33x4† 36x5* 36x3² 36x5* 36x3² 36x10 36x6 40x12 36x6 34x5 34x5 34x5 34x5 34x5 36x3 40x12 36x6 40x12 36x6 40x12 36x6 36x7 36x4 36x7	I B W W W W W W W W W W W W W W W W W W	Forschler, A Forschler, BX Forschler, BX Front Drive C G & J** 20 G & J** 20 G & J** 4 G & J** 8 G.M.C., K16 G.M.C., K41 A G.M.C., K41 A G.M.C., K101A G.W.W. Garford, 15 Garford, 77D Garford, 77D Garford, 150-A "2-eyl. †6-ey Trac., Tractor. Final Driver: Double Reduct	**Can: W—We ion, B	orm, I—I: —Bevel,	31/2x5 31/2x5 41/2x5/4 41/2x5/4 4x5/4 41/2x5/4 41/2x5/2 31/2x5/2 41/2x6 41/2x6 33/2x5/2 41/2x6 33/2x5/2 41/2x6 5 x6/2 5 x6/2 6	34x3 343 36x3 36x3 36x4 36x4 36; 5 34x5† 34; 36x4 36; 34x5† 34; 36x4 36; 36x5 40; 35x5 40; 36x6 40; 36x7 40; 36	14 W. 14 W. 15 W. 17 W. 18 W. 15 W.	Jumbo, 40 K-Z, 1 1/4 K-Z, 11/2 K-Z, 21/2 K-Z, 23/2 K-Z, 3/2 K-Z, 5 Kalamazoo, G-1 Kalamazoo, H Kalamazoo, H Kalamazoo, K Kalamazoo, H Kalamazoo, H Kalamazoo, K Karavan, A Kearns, N %Kelly-S, K-31 %Kelly-S, K-34 %Kelly-S, K-38 %Kelly-S, K-38	11235121223512	4730 1750 2075 2550 3350 2495 28908 45008 45008 45008 1150 2700 2900 2900 2900 3900 3900 3900	14200 31200 31200 31200 31200 41200 31200 4100 41	38x7† 34x3 2 36x4 36x4 36x6 34x4 36x4 36x4 36x4 36x4	34x5 36x8 40x6d 34x5 36x8 40x6d 34x5 36x8 36x8 36x8 36x8 36x8 36x8 36x8 40x5d 40x5d 40x5d 40x5d 40x5d 40x5d 40x5d 33x7† 33x7 30x7 30x7 30x7 30x7 30x7 30x7 30x7

1 | 214 | 2495 | 41/6x51/4 | 36x6† | 36x7† | 36x7†

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Front	RES	Final Drive	NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Front	RES	Final Drive	NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Frent	Rear
Kimball, AF Kissel, Express Kissel, Utility Kissel, Freighter Kissel, H. D. Kleiber, AA Kleiber, AA Kleiber, BB Kleiber, B Kleiber, C Kleiber, C Kleiber, C	5 1 11/2 21/2 4 1 11/2 2 21/2 31/2 5	\$5500 1935†1 1975 2875 3675 2200 3100 3600 3950 4600 5300 1995	5 x6 378x512 378x512 414x512 414x512 418x514 418x514 412x512 412x512 5 x612	36x6 34x5† 36x3½ 36x4 36x5 34x3½ 36x4* 36x5* 36x5 36x6 34x3½	40x7d 34x5† 36x5 36x7 36x5d 34x5* 36x6* 36x7* 36x5d 40x12 34x5	W W W W W W W W W	O. K., M1 Ogden, D Ogden, E Old Hickory, W Old Reliable, A Old Reliable, B Old Reliable, C Old Reliable, E Old Reliable, E Old Reliable (E	31/2 11/2 11/2 21/2 1 11/2 21/2 31/2 5 7	\$4250 1775 2350 3500 4250 5250 6000 1095 3200	33/4x5 4 x5	36x5 36x3½ 36x4 36x3½ 34x4 34x4 36x5 36x6 36x6 35x5† 36x4	36x5d 36x5 36x5 36x8 36x4 36x6 36x4d 36x5d 40x6d 40x7d 35x5† 36x8	WWWWWWWC1	Signal, J Signal, M Signal, R Southern, 10 Southern, 15 Southern, 20 Standard, 1-K Standard, 76 Standard, 66 Standard, 5-K Sterling, 1\(^1\)2 Sterling, 2	2\\\ 2\\\ 2\\\ 2\\\\ 2\\\\ 2\\\\\ 2\\\\\\	\$2875 3675 4400 2090 2590 2990 1600 2400 3150 4400 2885 3085	41/8x51/4 41/2x51/2 43/4x6 33/4x5 33/4x51/4 43/4x51/4 41/2x51/2 43/4x6 4 x53/4 4 x53/4 4 x53/4	36x6† 36x6†	36x8 40x5d 40x6d 34x4 34x4 40x8* 34x5* 36x7* 36x10 40x12 36x5* 36x6*
Koehler, M Koehler, MCS Koehler, F Koehler, MT, Trac Lange, B Larrabee, W Larrabee, U Larrabee, K Larrabee, K-5 Larrabee, L-4	21/2 21/2 21/2 35/2 5 21/2 11/2 21/2 21/2 31/2 31/2 31/2	3175 3275 4150 3275 3350 1925 2100 2400 3103 3450 4000 4400	4 x5 8 4 x5 8 4 x5 8 4 2x5 2 4 x5 8 4 2x5 2 4 3 4 4 2 3 4 4 2 3 4 4 2 4 2 4 2 4 2 4 4 4 4 2 4 4 4 4 4 4 4 4 4 4	36x4 36x5 36x4 36x4 34x5 34x5 34x3	36x7 36x7 36x7 36x7* 34x5† 34x5* 34x5* 36x7 36x8 36x5d 36x10	W W W W W W W W	Olympic, A Oshkosh, A Oshkosh, B Oshkosh, BB Packard, EC Packard, EC Packard, ED Packard, ED Paige, 52-19 Paige, 54-20 Paige, 51-28 Parker, F20	2 2 2 1/2 21/2 11/2-3 11/2-3 2-41/2 4-71/2 11/2 21/2 21/2 21/2	3750 3850 4150 4300 3100 3100 4100 4500 1950 2420 3145 3500	3/2x5 3/2x5 4 x5/8 4 x5/8 4 x5/8 4 x5/2 4 x5	36x6† 36x6† 38x7† 38x7† 36x4 36x6† 36x5 36x6 34x31/2 34x4 36x5 34x4	36x6† 36x6† 38x7† 38x7† 36x7 40x8† 36x5d 40x6d 34x5 34x8 36x5d 36x4d	4 4 W W W W W W W W	Sterling, 2½ Sterling, 3½ Sterling, 5-W Sterling, 5-C Sterling, 7½ Stewart, 14 Stewart, 15 Stewart, 7 Stewart, 7 Stewart, 7 Stewart, 10-X	21/2 31/2 5 5 71/2 34 11/2 21/4 31/2 31/2	3290 4325 4950 5500 6000 1195 1395 1790 2090 2290 3090 3850	43 (x53 2 41 2x0 1 4 5 x0 1 4 5 x6 1 4 5 x6 1 4 5 x6 2 35 (x5 5 6) 33 (x5 5 6) 33 (x5 5 6) 41 (x5 1 4) 41 2 x 5 2 41 2 x 5 2	36x4* 36x6* 36x6 36x6 32x4! 2† 35x5† 34x3! 2 34x4 34x4 36x5	36x4d* 40x5d* 40x6d* 40x6d 40x7d 32x412† 35x5† 34x5 34x7 34x7 36x5d 36x5d
Luedinghaus, C Luedinghaus, W	5 1 1½ 2-2½ 1½ 2-2½ 1½ 3 4 5-6 1½ 1½	4800 1690 2490 2790 2700 3100 3400 4200 4950 5750 3150 3000	43416 31455 334754 1147534 418854 418854 412854 43486 41286 4 85	36x6 35x5† 34x3½ 36x4 36x4 36x4 36x4 36x5 36x5 36x5 40x7 36x4 36x4	40x6d 35x5† 34x5* 36x7* 36x6 36x4d 36x5d 36x6d 40x6d 40x14 36x31/2 36x31/2	W W W W W W W	Parker, J20 Parker, M20 Patriot, Revere Patriot, Lincoln Patriot, Washgt'n Piedmont, 4–30 Pierce-Arrow Pierce-Arrow Pierce-Arrow Pierce-F, 59	31/2 5 1 2 3 1 2 31/2 5 1 1/2-2	4400 5500 1500 2050 2900 1200 3200 4350 4850 1550 3800	41/2x6 43/4x6 33/4x5 4 51/4 41/2x51/2 31/2x5 4 x51/2 41/2x63/4 41/2x63/4 41/2x63/4 41/2x63/4 41/2x63/4 41/2x63/4 41/2x63/4 41/2x63/4	36x5 36x6 35x5† 34x3½ 36x4 34x4† 36x5 36x5 36x5 36x4 36x4 36x5	40x5d 40x6d 35x5† 34x5 36x7 34x4† 36x4d 36x5d 40x6d	W W W W W W W W W W W W W W W W W W W	Stoughton, C Stoughton, F Stoughton, B Stoughton, D Stoughton, E Sullivan, E Sullivan, H Superior, D Superior, E Super Truck, 50 Super Truck, 10 Super Truck, 10	31/2 11/2 2 31/2 2 31/2 5	1240 1790 2150 2490 3150 2800 3750 1650 2600 3300 4300 5300	33/4x5/4 33/4x5/4 1 x5/6 1/4x5/2 1/4x5/2 1/2x6 33/4x5 1/2x6 4 x6 43/4x6	34x4½† 34x4½† 36x3½ 36x4 36x5d 36x4* 36x5 34x4½‡ 36x4 36x4 36x5 36x5	34x4½† 35x5† 36x5 36x7 36x5d 36x7° 36x5d 34x4 36x6 36x8 40x5d 40x12
Mack, AB Chain Mack, AB D.R. Mack, AB DR Mack, AC Chain Mack, AC Chain Mcck, AC Chain Mack AC Chain Mack Trac., AB Mack Trac., AC Mack Trac., AC	222235675703	3300 3750 3850 3400 4950 5500 5750 6000 3400 4950 5500 5750	4 x5 4 x5 4 x5 5 x6 5 x6 5 x6 5 x6 5 x6 5 x6 5 x6 5	36x4 36x4 36x4 36x5 36x6 36x6 36x7 36x4 36x5 36x6 36x6	36x4d 36x4d 36x4d 40x5d 40x6d 40x12 40x7d 36x4d 40x5d 40x6d 40x12	CDDCCCCCCCCCC	Power, F Power, C Premocar, B-143 Rainier, R-21 Rainier, R-19 Rainier, R-18 Rainier, R-20 Rainier, R-15 Rainier, R-17 Ranger, TK-22-2 Reo, F	2 31/2 11/2 3/4 1 11/2 2 21/2 31/2 5 2 3/4-1]	3150 4250 2475 1990 2150 2490 2890 3550 4400 5100 2775 1245	334x514 414x512 312x5 312x5 312x5 312x5 412x514 412x514 412x514 412x514 412x5 412x5 412x5 412x5	36x5 36x6† 35x5† 34x3½ 34x3½ 34x4 36x5 36x6 36x6† 34x4½	36x7 40x10 36x6† 35x5† 31x4 34x5 34x6 34x7 36x5d 36x6d 38x7† 34x4½†	W W W W W W W W W W W W W W W W W W W	Super Truck, 150 Texan, A38 Texan, TK39 Thomat Speed T'k Tiffin, GW Tiffin, MW Tiffin, PW Tiffin, F50 Tiffin, F60 Titan Titan	7124 1124 1122 1122 1122 1122 1122 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 1222 122	6300 1095 1550 1795 2100 2700 3600 4300 4500 2950 3950 4550	5 x6 312x5 312x5 4 x514 118x514 118x514 112x512 134x6 134x6 134x6 114x514	36x6 33x4 36x6 34x5 36x3 36x4 36x5 36x6 36x6 36x6 36x5 36x5	40x7d 33x4 38x7 34x5 36x5 36x3 40x5d 40x6d 40x6d 40x12 36x7 40x10 40x6d
Mack Trac., AC Mapleleaf, BB** Mapleleaf, BB** Mapleleaf, CC** Mapleleaf, DD** Master, JW Master, JW Master, Z Master, W Master, DM Master, DM Master, DM	15 2 3 4 5 11 2 2 12 2 12 3 3 4 3 3	6000 3775 4350 5100 6200 2290 2290 2290 2290 3190 3990 4290	5 x6 4 x5 4 4 4x5 2 4 2x5 2 4 2x5 2 4 8x5 2 4 8x5 2 4 4x5 2 4 4x5 2 4x5	36x7 36x4 36x4 36x5 36x6 34x31 2 34x31 2 34x31 34x4 36x5 36x5	36x7 36x7 40x5d 40x5d	CWWW DW	Reliance, 10A Reliance, 20B Republic, 75 Republic, 175 Republic, 10Exp. Republic, 11X Republic, 20 Rewe, CW Rowe, C. D. W. Rowe, G. S. W. Rowe, G. S. W. Rowe, H. W.	11/2/2/3/4	2400 3100 1395† 1395 1695 1795 2195 3095 3000 3300 4150 5250	4 x512 414x512 312x5 334x5 334x5 412x512 334x5 412x512 334x5 4 x6 314x5‡	36x3½ 36x4 32x4½ 34x3 35x5† 34x3½ 36x4 36x5 36x6† 31x4 31x5 38x7†	34x4 34x5† 34x6 36x7 36x10 36x6† 36x3† 24x9†	I I W W W W	Titan, 6-Ton Tower, J Tower, H Tower, G Traffic, C Traffic, C Transport, 20 Transport, 30 Transport, 50 Transport, 70 Transport, 70 Traylor, B Traylor, C	0 11/2/2 31/2 31/2 31/2 31/2 31/2 31/2 31	5150 2900 3200 4100 1595 1895 1395 1995 2785 3885 2390 2850 2300	41-2x6 11-6x514 11-2x512 33-4x5 33-4x5 33-4x5 11-2x6 33-4x5 11-2x6 33-4x5 11-2x6 33-4x5 11-2x6 33-4x5 11-2x6 33-4x5 11-2x6 33-4x5 11-2x6	36x5 35x5 36x4 36x5 34x3! 2* 36x3! 2 36x3! 2 36x4 36x5 34x3! 2 36x4 36x4	40x12 38x7 36x7 36x5d 34x5* 36x7 34x4 36x5 36x7 36x10 34x5 36x7 36x7 36x7 36x8*
Master, Y Master, B Master, B Master Trac.,DDT Maxwell, 1½ Menominee, HT Menominee, B Menominee, G Menominee, G Monominee, J-3 Moline, 10 Moreland, R. R.	5 6 1 ¹ / ₂ 1-1 ¹ / ₄ 1 ¹ / ₂ 2-2 ¹ / ₂ 3 ¹ / ₂ 5 1 ¹ / ₂ 1	4490 4990 5090 3390 932 2000 2175 2875 3800 4850 1985 1595	4½x6 4¾x6½ 4¾x6½ 1¼x5½ 3½x5 4 x5 4 x6 4½x6 4¾x6 3½x5 4 x5	36x5 36x6 36x6 34x4 32x3 34x3} 36x3 36x3 36x5 36x6 34x5† 34x5†	36x8 36x10 40x12 36x6† 34x5†	W D D W W W W W W W I B	Rowe, F. W. Ruggles, 20 Ruggles, 40 Sandow, G Sandow, CG Sandow, J Sandow, M Sandow, L Sanford, 25 Sanford, 35 Sanford, 50	4 5 1 2 1 1 1 2 2 1 2 1 2 3 1 2 3 1 2 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	4500 5500 1195 1795 2295 2590 3275 4295 4975	11/4x6 11/2x6 33/4x5 4 x5 33/4x5 41/2x5 41/2x5 41/2x5 41/2x5 41/2x5 41/2x5 41/2x5 41/2x5 41/2x5 41/2x5	36x5 36x6 34x5† 34x5† 34x4 36x4 36x5 36x6 36x4 36x5 36x5 36x5	36x6d 40x6d 34x5† 34x7 34x5 31x6 36x7 36x5d 40x6d 36x4d 36x5d 40x6d	WWBDWWWWWWWWWWW	Traylor, D Traylor, E Traylor, F Triangle, AA Triangle, A Triangle, C Triangle, B Triumph, HC Triumph, HB Twin City, B.W. Twin City, A.W.	4 5 34-1 11/2 2 21/2 1 11/2 2 2 31/2	4450 4700 1385 2350 2700 2950 1995 2550 2900 2750 3950	11/4x5/2 11/2x6 11/2x6 31/4x5 33/4x5/4 4 x5/3 4 x5/4 33/4x5/4 4 x5/2 11/4x6	35x5 36x6 34x4½† 34x3½* 36x4* 36x4* 36x3½ 36x4 36x4 36x4	40x10 40x6d 34x41/41 34x6* 36x6* 36x7* 34x5† 36x7 36x7 40x5d
Moreland, BX Moreland, EX Moreland, AX Moreland, RX Napoleon, 7 Napoleon, 9 Napoleon, 11 Nash, 2018 Nash, 3018 Nash, Quad. Nash, 3018, LWB Nash, Quad. LWB	11/2 2 3 41/2-5 34 1 11/2 1-11/2 2-21/2 2-21/2 2-21/2 2-21/2	1980 2800 3500 4600 1350 1535 1860 1595 2150 2750 2200 2800	4 x5 418x514 412x512 434x6 312x5 312x5 312x5 334x514 414x512 334x534 414x512	36x6	36x6* 36x7* 36x10* 40x6 33x4† 35x5* 36x6* 40x8 40x8 40x8 40x8	W W W V I I I I I	Schacht, 2-Ton Schacht, 3-Ton Schacht, 4-Ton Schacht, 5-Ton Schacht, 7-Ton Schwartz, A Schwartz, BW Schwartz, C.W.S. Schwartz, DW Selden, 30 Selden, 31 Selden, 50	2 3 4 5 7 1 1,2 2,2 1,2 2,1,2 2,1,2	3200 3800 4200 4400 5000 16.45 26.00 3200 4900 2250 3350 3250	114x512 114x512 112x6 112x6 112x6 112x6 112x6 114x512 114x512 114x512 114x514 114x514	36x4 36x5 36x5 36x5 33x4½1 34x3½ 36x4 36x6 31x3½ 34x5 36x4	36x7 36x5d 40x5d 40x6d 40x7d 33x4½ 34x7* 36x8 40x12 34x5 38x7 36x7	WWWWWWWWWWWWWWWWWWWWWWWWW	FT win City, B FT win City, A Ultimate, A Ultimate, AJ Ultimate, B, Ultimate, B Ultimate, B Ultimate, B Ultimate, D Union, FW Union, HW Union, JW Uniot, A	3½ 5 2 2 2 3 3 5 1½ 4 6 1½	3200 3250 3300 3750 3850 5500 3490 4485 5800 2445	518x6 518x6 4 x51/2 41/4x51/2 41/4x51/2 41/4x51/2 5 x61/2 4 x6 11/2x6 5 x 6 33/4x51/4	36x6 36x7 36x31/2 36x31/2 36x4 36x4 36x6 36x6 36x6 36x6 36x6	36x6 36x7 36x6 36x6 36x4 36x4d 40x12 36x8* 40x12 40x14 31x5*
Nelson, F1/3 Nelson, F2 Nelson, F3/4 Nelson, FC5 Netzo, DK Netro, HL New York, M New York, N Niles, E Noble, B30	11/2 31/2 5 2 21/2 11/2 2-21/2 2 11/2	2250 3100 3500 3000	41 4 x 51 2 33 4 x 51 4 41 8 x 51 4 41 8 x 51 4 42 x 51 2 43 4 x 6 41 8 x 51 4 41 8 x 51 4	36x3/2 36x4 36x5 36x6 36x4* 36x3/2 30x4 36x3/2	34x6 36x5 36x7 36x5d 40x6d 36x7* 36x8* 36x5 36x4d 36x7* 36x5	WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	Selden, 51 Selden, 70 Selden, 90 Seneca, M Service, 12 Service, 15 Service, 31 Service, 36 Service, 36 Service, 71	24-34 312-5 5-7 12 34 114 112 2 2 212 312	4350 3750 4950 920	41/8x51/4 41/2x51/2 41/2x51/2 41/2x51/2 41/2x51/2 43/4x6 31/8x41/2 33/8x5 31/2x51/8 4 x51/2 41/4x51/2 41/4x51/2	36x6† 36x5 36x6 30x3† 232x4† 231x4† 234x3† 235x5† 36x4 36x5	40x8† 36x10 40x12 † 30x3½; † 32x4½; † 35x5† 34x5 36x6 38x7† 36x7	W W B B B W W W W W W	United, B United, C United, V United States, U United States, NW United States, N United States, R United States, T Velie, 46 Veteran. M°*	21/2 31/2 5 1 11/2 11/2 3 4 6 11/2 11/2	3150 3975 4500 1875 2225 1975 3075 3875 4850 1585 2699	114x512 114x512 112x6 354x518 334x5 4 x514 412x512 42x512 334x5 334x5 334x5	36x4* 36x5 36x6 34x5† 36x5 36x4 36x5 36x6 36x3½ 35x5†	36x7* 36x5d 40x6d 34x5† 36x31* 36x54 36x5d 40x6d 36x5 35x5†
Noble, C40 Noble, D50 Noble, E70 Northway, B-2 Northway, B-3 Northwestern W Northwestern WS Norwalk, 25E Norwalk, 35E Norwalk, 35E No. K, K1 O. K., K1	111/2	3400 4400 2700 3500 1595 1925 2285 2450 3250	4 x5\2 4\x5\2 1\2x6 4 x6 4 x6 4\x6 4\x5\4 1\2x5\2 3\2x5 3\2x5 3\4x5\4 4 x5\4	36x4 36x5 36x4 36x5 34x4 36x4 34x3 34x3 34x3 34x3 36x3	34x3½ 31x5		Service, 101 Signal, NF Signal, H *2-cyl †6-cy Trac., Tractor. Final Drive: Double Reduct Gear. *Tires—	on, !!	1950 2450 cyl. All adian ma orm, I—I 3—Bevel, al. †Pno	112x6 112x6 434x5 412x514 others, no de. internal G 4—Four- cumatic Ti	Wheel, res. All	ethers so	nal	Veteran, R**	2 3 4 1/2 1/2 1 2 3 21/2 3	3699 4200 5395 1050 1175 1975 3150 3950 4000 4500 2500 3500	414x514 414x6 414x6	36x4 36x5 31x4† 32x4½ 35x5† 36x4	36x7 36x7 36x10 31x4† 32x4† 35x5† 36x6 36x5-1 36x8 40x8 38x7

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Front	Rear	Final Drive	NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Front	RES	rmal Drive	NAME AND MODEL	Tons	Chassis Price	Bore and Stroke	Front	RES	Final Drive
Walter, S. Ward-LaF., 2B. Ward-LaF., 4A. Ward-LaF., SA. Watson, B. Watsern, N. Western, N. Western, N. 1½. Western, W. 1½. Western, W. 1½. Western, W. 1½. Western, W. 1½. White, 15. White, 45. White Hick., E. Wichita, K. Wichita, M. Wichita, M.	5 2 3 5 1 2 2 2 3 5 1 1 2 2 2 3 3 5 1 1 2 2 2 3 5 1 1 2 2 2 3 5 1 1 2 2 2 3 5 1 1 2 2 2 3 5 1 1 2 2 2 3 3 5 1 2 2 2 3 3 5 1 2 2 2 3 3 5 1 2 2 2 3 3 5 1 2 2 2 3 3 5 2 2 2 2 3 3 5 2 2 2 2 2 2	\$4850 2990 3990 4590 1635 3825 2550 2550 3250 4250 2100 3250 4200 4500 1225 1375 1675 1875 2400	112x014 5 x014 112x514 112x514 112x514 112x514 112x514 112x6 314x514 314x53 314x53 112x53 314x5 314x5 314x5 314x5 314x5	36x6 36x4 36x5 36x5 36x5 36x3 36x3 36x4 36x4 36x4 36x4 36x4 36x5 36x6 34x5† 36x3 36x3 36x3 36x3 36x3 36x3 36x3 36x	40x6d 36x4d 36x5d 40x6d 35x5d 36x10 36x5* 36x7 36x7 40x5d 40x5d 40x5d 40x5d 40x5d 34x5† 36x7 40x5d 34x5† 36x7 40x5d 34x5† 36x6 36x6 36x6 36x6 36x6 36x6 36x6 36x6 36x6 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x6 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x7 40x5d 36x6 36x7 36x7 40x5d 36x6 36x7 36x7 36x7 40x5d 36x6 36x7 36x7 36x7 36x7 40x5d 36x6 36x7 36x	W W W W W W W W W W W W	Wilson, H Winther, 751 Winther, 430 *2-cyl. †6-cyl. Trac., Tractor. * Final Drive: W	-Wor n, B- tional.	dian mad m, I—In Bevel, †Pneu	11/2x6 43/4x61/2 33/4x5 41/8x51/2 43/4x6 31/2x5 33/4x5 others, no le.	ar, C—C Wheel, I	36x5d* 36x4* 36x5 36x3½d* 40x6d 36x5 36x7 36x7 36x5 40x6	WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW	Winther, 39 Winther, 49 Winther, 50 Winther, 50 Winther, 70 Winther, 140 Wisconsin, A Wisconsin, C Wisconsin, C Wisconsin, C Wisconsin, E Wisconsin, F Witt-Will, P Wolverine, J Wolverine, J Wolverine, J Wolverine, J Wolverine, L	11/2 21/4 31/2 21/2 5 7 11/2 21/2 11/2 21/2 31/2 21/2 31/2	\$2450 3250 3995 4203 3690 5250 5900 2100 2703 3000 3500 4000 2250 2750 2125 2375 2640 3425 4100	334x5 4 x5 4 x6 4 x6 4 x6 4 x5 41,2x6 334x5 334x5 5 x634 43,6x534 43,6x534 43,6x534 43,6x534 41,6x634 41,6x634 41,6x634 41,6x634 41,6x634 41,6x634 41,6x634	34x3/2 34x4 38x7† 36x5 36x6 36x6 35x5 36x6† 36x6† 36x6 36x3/2* 36x3/2* 34x3/2 34x3/2 34x3/2 36x5	34x5 34x4b 42x1† 36x5b 36x6 40x7b 34x5† 36x6 36x7 40x8 36x10 36x12 36x5* 36x7* 36x10 36x10 36x10 36x10 36x10	I I I I W,B W W W W W W W I I I I I I I I I I I I

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plew Capacity	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow	TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Strake	Fuel	Plew
All-In One Allis-Chalm. B Allis-Chalm Allis-Chalm Allis-Chalm Allwork 2-G	6-12 15-25 20-35 20-35 14-28		2 4 4 4	Weid. LeR. Midw. Own Own		Gas. Gas. GorK G,K GorK	2-3 1 3 3-4 4 3	Frick A Frick C Grain Belt A Gray 1920 Ground Hog	12-20 15-28 18-36 18-36 19-31	2000		Erd. Beav. Wauk. Wauk Erd.	4-43/4x63/4 4-43/4x63/4 4-4 x6	Gas, G or K	2-3 3-4 4 4 3	OshkoshG PeoriaL PioneerG PioneerC PlowmanA	12-24 12-25 20-40 40-75 15-30	1600 1750 3550	4 4 4	Own Clim. Own Own Buda	2-6 x7 4-5 x6½ 4-5½x6 4-7 x8 4-4½x6	G,K G,K,D Gas. G,K	3 4 10 3-4
AllworkC AndrewsKin.D Appleton ARO1921-22 Aultman-T, Aultman-T,	14-28 18-36 12-20 3-5 15-30 22-45 30-60 12-24	1500 385 2200 3420 4500	4 4 4 4	Own Clim. Buda Own Clim. Own Own Here.	4-5 x612 4-414x512 1-412x5 4-5 x612 4-512x8 4-7 x9	G,K Gas.	3 4 2-3 1 4 6	Gt. Western St Hart-Parr 20 Hart-Parr 30 Heider	20-30 30 9-16 12-20	945 1295 870 900 800 1185	4 4 4 4	Beav. Own Own Wauk Wauk LeR. Wauk	2-51/4x61/2	K,D. G,K G,K Gas.	2 3 2 3 1 3	Reliable Rex Russell Russell Russell	10-20 12-25 12-24 15-30 20-35 30-60		4 4 4 4 4	Own Wauk Own Own Own Own		Ker. G or K G or K G or K G or K G or K	4-1
Automot. B-3 Avery, SR.Cul Avery. Cult-C Avery. B Avery. C Avery. C Avery. Avery. Avery. Avery. Avery.	5-10 5-10 8-16 12-20		344444	Own Own Own Own Own Own Own Own	4-4 x51/8 4-3 x4 6-3 x4 4-3 x4 6-3 x4 2-51/2x6 4-4/2x6 4-4x51/2 2-61/2x7	G,K G,K G,K G,K,D G,K,D G,K,D G,K,D	2 2-3 3-4 3	Huber Super 4 Illinois, Super- DriveC ImperialE IndianaF International. Internati.Titan	15-30 40-70 5-10 8-16	1885	4 4 2 4 4	Midw. Clim. Own LeR. Own	4-41/2x6 4-5 x61/2 4-71/2x9 4-31/8x41/2 4-41/4x5 4-51/4x8	Gas G,K G,K,D Gas. G,K,D G,K,D	3 4 10 1-2 2 4	Samson	10-20 15-35 15-30 9-18 20-40 12-24 18-36	1750 1500 1485	4 4 3 4	Own Own Own Beav. Wauk Beav. Own Beav.	4-4 x5/4 4-4/4x5/4 4-5 x6/2 4-4%x6 4-3%x5/4 4-4%x6 4-4 x5 4-4%x6	G,K,D G,K	2 2 4 3 2 3 4
Avery Avery Avery	14-28 18-36 25-50 45-65		4 4 4	Own Own Own Own	4-45% 4-5\2x6 4-6\2x7 4-734x8	G,K,D G,K,D G,K,D G,K,D	3-4 4-5 5-6	J-T N	15-30 20-40 18-32		*2	Own Chief. Clim.	4-4½x6 4-4¾x6 4-5 x6½	G,K,D G,K,D	3-4	Tioga3 Topp- StewartB Toro Cultivator	15-27 30-45	1985	4	Wisc. Wauk LeR	4-4½x6 4-4¾x6¾ 4-3½x4½	Gas.	3-4
Bates Bates Mule . H Bates Mule . G Beeman G Best	18-25 25-35 2-4 18-30 60	240 3100 5450 1850	*2 *2 3	Own Midw Midw Own Own Own Wauk Own	4-414x6 4-418x514 4-416x514 4-416x514 4-416x6 1-316x416 4-434x616 4-616x816 4-436x534 2-614x7	Gas. Gas. Gas. G,K,D	8-9	LaCrosseM LaCrosseG Lauson5 Lauson20	25-45 6-12 12-24 12-25 15-25 15-30 15-30 12-18	650 985 1495 1685 1985	4 4 4 4 4 4 4	Own Own Own Midw Beav. Beav. Own Clim.	4-51/8x9 2-4 x6 2-6 x7 4-41/8x51/4 4-41/2x6	G or K G or K K G,K,D	4-6 1 3 3-4 3-4 3-4 2-3 3-4	ToroTractor'22 Townsend Townsend Townsend Traction Motor TraylorTB TriumphH Trundaar10	6-10 10-20 15-30 25-50 40-50 6-12 18-36 25-40 14-25 12-20	715 2450 3750 2500 715 2450 3750 1295	3 2 2 2 4 4 4 2 *2 4	LeR Own Own Own LeR. Erd. Wauk Buda Own	4-3/ ₅ x4/ ₄ 4-6/ ₂ x7 4-7 x8 4-8/ ₂ x10 8-3/ ₄ x5 4-3/ ₈ x4/ ₂ 4-4/ ₄ x5/ ₄ 4-4/ ₄ x5/ ₄	Gas. Ker. Ker. Gas. Gas. Ker. G or K	2 2 2-3 4-1 4-1 1-2 4 4 3 3
Capital	5-21	700 1320 2550 3975 6050 388	4 4 4 4 *2 *2 2	Own Own Own Own Own Own Own	4-4-1-x6 4-3/x5 4-4/-x6 4-5/-x63/x 7 x8 4-43/-x6 4-6/-x7 2-4/-2x4/-2 4-4/-2x6	G,K,D Gas. Gas.	3 2 3-4 4-5 8-10 4 6	LeaderGU LeonardE LinnH4J LinnW	18-36 20-30 40- 60 16-22 26-35	2150	*2 4 *	Clim. Buda Cont. Wauk Own Own	4-5 x6½ 4-4½x6 4-4½x5½ 4-5 x6¼ 4-4½x5	G,K G,K Gas Gas K	3-4 3 4 6 4 6 16 6-10	Twin City Twin City Uncle Sam C20 Uncle Sam B19 Uncle Sam D21 Utilitor501 VimB	20-35 40-65 12-20 20-30 20-30 21-4 15-30	2950 4750 1385 2300 1985 295	4 4 4 4 4	Own Own Weid. Beav. Beav. Own	4-51/2x63/4 4-73/4x9 4-4 x51/2	GK GK G or K G or K G or K	8 2-3
Chicago 40 Cletrac F Cletrac W Dakota 4 Dart B.J. Dopue A Dill D Dill R.W. Do-It-All A	9-10 12-20 15-27 15-30	1348 7 1500 1800	*2 *2 3 4 4 4	Own Own Own Dom, Buda Buda Cont. Midw.	4-3/4x4/4 4-4 x5/4 4-4/4x6 4-4/4x6 4-4/4x6 4-4/4x6 4-4/4x6	Gas. Gas. Gas. Gas.	2 2-3 3-4 4 3 3	MerryGar1922 MinneAll-P Minne. Gen.P Minne. Med.Duty Minne.	5-10 2 12-25 17-30	585 210 900	2 4 4	Wauk LeR. Evin Own Own	1-25/8x21/2 4-41/2x7 4-43/4x7	Gas.	3 3 3-4 5-6	Wallis K Waterlee N Webfeet 53 Wellington . B Wellington . F Wetmore21-22 Whitney D	15-25 12-25 28-53 12-22 16-30 12-25	†995 675 5000	4 4 *2 4 4 4	Own Own Wise. Erd Chief Wauk Own	4-41/4x53/4 2-61/2x7 4-53/4x7	G,K G,K G,D Ker. Ker. G,K	3 3 6 2-3 3-4 3 2
Do-It-All A Eagle F Eagle F E-B A E-B Q E-B	12-2: 16-3: 12-2:	590 2 0 1090 0 750	4 4 4 4	Own Own Own Own Own Own	1-41/2x5 2-7 x8 2-8 x8 4-43/4x5 4-43/4x5 4-51/4x7	Gas. Gork Gork G,K,D G,K,D G,K,D	3-4 4-5 3 3	Mehawk . 1921	35-70 8-16 9-18 9-18 11/2 15-30	785 990 990 195	2 2 2 2	Own Light Own Own Own Buda	4-7!4x9 4-3!4x4!2 4-3!2x5 4-3!2x5 1-234x3!2 4-4!2x6	Gas.	8-9 1-2 2-3 2-3 3-4	WisconsinE WisconsinF Wisconsin,H	15-30 16-30 20-40 22-40 12-20	2500 1850 2050 2550 2400 2750	4 4 4 4 4 4 4 2	Beav. Clim. Wauk Clim. Wisc. Wisc.	4-41/2x6 4-5 x61/2 4-5 x61/4 4-51/2x7 4-41/2x63/4 4-41/4x6	G,K,D G or K G or K G or K G,K,D	3-4-4-4-6
FageelD Farm Herse, B Farquhar Farquhar Farquhar Fitch4	18-3 15-2 18-3 25-5 20-3	188	4 4 4 4	Lyc. Clim. Buda Own Own Clim. Own	4-31/2x5 4-5 x61/2 4-41/2x6 4-6 x8 4-7 x8 4-5 x61/2 4-51/4x6	G,K,D G,K,D G,K,D	4-5	Nilson Senior	20-42	3000	4	Own Own Own Wauk	2-3 ³ / ₄ x4 8 x10 9 x12 4-5 x6 ¹ / ₄	Gas. G or K G or K G,K	3-6 4-7	Yuba 25-35 Yuba 25-40 ‡Yuba Zelle	20-35 25-40 25-40 12-25	3900 4250 4750	*2 *2 *2 *2 4	Wisc. Wisc. Yuba Buda	4-53/4x7 4-53/4x7 4-51/4x7 4-41/4x51/4	G,K,D G,K,D D	4

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beaver. Clim.—Climax. Cont.—Continental. Dom.—Doma Evin.—Evin.—Evinude. Here.—Hercules. I.e.R.—I.e.Roy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. Strns.—Stearn T.C.—Twin City. Walk.—Walkesha. Weid.—Weidely. Wis—Wisconsin. *—Crawler type. All others are wheel type. †Prie